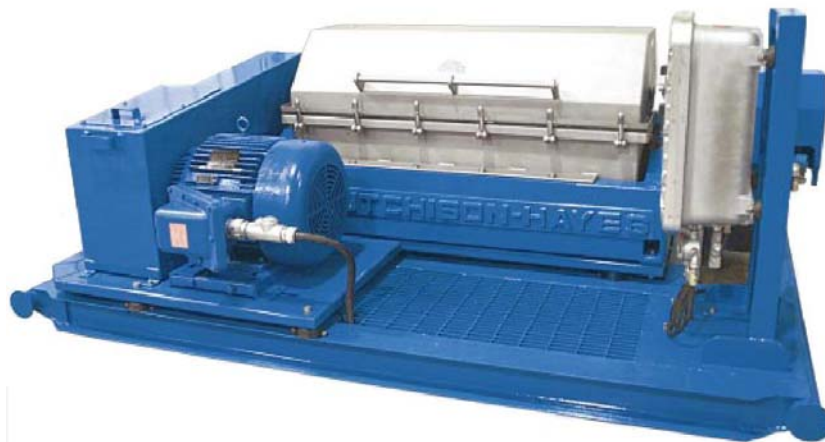




HUTCHISON HAYES, L. P.

1448 STANDARD CENTRIFUGE OPERATIONS MANUAL

Revised January 2005



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SECTION I

INTRODUCTION

OVERVIEW

HUTCHISON HAYES CENTRIFUGE STANDARD MODEL 1448

This Service Manual describes the centrifuge, and lists instructions for the installation, operation, and maintenance requirements.

The basic purpose of this centrifuge is to separate the liquid and solids from the fluid feed (slurry.)

A stainless steel rotating bowl, driven by a 50 H.P. electric motor is used to centrifuge the slurry; that is to sling the solids against its inside wall surface while a stainless steel screw conveyor (faced with hard tiles) gathers and conveys these solids to a central discharge area.

The conveyor is driven at a slightly slower RPM through a planetary gear reducer.

The liquids migrate to the front end of the machine and are dispelled through four (4) adjustable plate dam openings, to a central discharge area.

For a more comprehensive description of how the centrifuge operates, see the Operation Section of this manual.

1448 INDUSTRIAL MODEL CENTRIFUGE

DATA

Using P-52 Gear Unit:

Normal Bowl Centrifugal Force	2118 G's
Normal Bowl Operating Speed:	3250 RPM
Normal Conveyor Operating Speed:	3187 RPM

Max. Bowl Centrifugal Force:	3180 G's
Max. Bowl Operating Speed:	4000 RPM
Max. Conveyor Operating Speed:	3926 RPM

P-125 Gear Unit:

Normal Bowl Centrifugal Force:	2118 G's
Normal Bowl Operating Speed:	3250 RPM
Normal Conveyor Operating Speed:	3224 RPM

Max. Bowl Centrifugal Force:	3180 G's
Max. Bowl Operating Speed:	4000 RPM
Max. Conveyor Operating Speed:	3968 RPM

P-52 Gear Unit:

Max. Output Shaft Torque:	18,000 LB. IN.
Max. Pinion Shaft Torque:	320 LB. IN.
Ratio: 52:1	

P-125 Gear Unit:

Max. Output Shaft Torque:	18,000 LB. IN.
Max. Pinion Shaft Torque:	180 LB. IN.
Ratio: 125:1	
Rated Solids Output:	6,000 LBS./HR.

Centrifuge	
Bowl Inside Diameter:	14 IN.
Bowl Length:	48 IN.



SECTION 2

START-UP

SAFETY

Because the Model 1448 Centrifuge is a high-speed, high-torque piece of rotating machinery, **caution** should be exercised by operating personnel.

HH recommends operating personnel review the centrifuge manual **before** working with the equipment.

Periodic safety meetings to familiarize new operating personnel with the centrifuges characteristics are also recommended.

This manual is intended for use by **qualified operators familiar** with processing equipment and trained for this particular centrifuge.

Maintenance personnel should be experienced mechanics.

Electricians should be licensed, qualified personnel familiar with electrical safety procedures.

CAUTION

Persons without recommended experience may not understand the instructions listed in this manual

A. GENERAL

1. Read all manuals and instructions before attempting to install or operate equipment, and follow all recommendations.
2. Follow all lubricating and/or greasing procedures and schedules recommended in the equipment instructions.
3. If nameplates are lost, damaged, or removed, replace them. They have been affixed to the equipment to provide warnings, instructions, etc., for the maintenance and operating personnel.
4. Do not operate belt driven or chain driven equipment without guards. If equipment was purchased without guards, user is responsible for providing proper guards that meet all applicable codes.
5. Make periodic checks for loose bolts on rotating assemblies, the supporting structure, covers, hatches, guards, and piping connections.
6. Do not operate equipment if excessive vibration or abnormal noise develops.
7. If the equipment is supplied with covers or guards, do not remove these until the equipment has come to a complete stop.
8. Never operate equipment with parts that have not been manufactured or approved by the original equipment manufacturer.

B. HANDLING

1. Safe practices for lifting and handling equipment should be followed. Hoists and slings should be of adequate capacity, inspected regularly, and in good repair.

2. Always use extra caution when lifting, moving, or holding worn parts, since these may be sharp, slippery, or weakened. Never place hands, feet or head at possible pinch points.
3. Always provide a sufficiently large cleared area around the equipment during maintenance.

C. ROTATING EQUIPMENT

1. Do not exceed the maximum speed, process material specific gravity, process pressure or temperature, or maximum design feed rate as specified on the equipment nameplate or within the operating manual.
2. Do not use a pipe wrench on any part of the rotating equipment.
3. Do not interchange parts that have been balanced as an assembly.
4. Do not attempt to utilize the rotating equipment in an application for which it was not originally selected.
5. When taking samples or removing any material from equipment like grinders, screw conveyors, open throat pumps, etc., make sure all machine components are at rest and the power is shut off with the disconnect switch locked in the off position.
6. Do not get rags, loose clothing, sticks, etc., near rotating or moving parts.
7. The equipment must coast to a complete stop. Do not brake it by hand or in any other way force it to stop, unless it is equipped with a braking mechanism supplied by the original equipment manufacturer.
8. Do not operate the rotating equipment unless the direction of the rotating part or assembly conforms to that of the Instruction and/or Operation Manual.
9. If a rotating assembly must be turned by hand, use caution: Avoid sharp edges and close areas where fingers may be cut or trapped (example: pulleys).

D. PUMP

1. If positive displacement pumps are used in the process be sure the discharge line is unobstructed before starting the pump.
2. In plants using any type of grinder with the discharge directly connected to a pump, be sure that the pump is in operation before putting any product into the grinder.
3. Do not run a positive displacement pump dry.

E. EXPLOSION PROOF EQUIPMENT

1. Do not operate equipment driven by an explosion-proof motor and control until all seal fittings are properly sealed with recommended fiber or compound, and tagged.
2. Never use abrasive material or a file to remove corrosion from explosion-proof equipment.
3. Cover screws and bolts used to hold explosion-proof joints together must always be tight, and only of the type and material recommended by the manufacturer.

F. MOTOR

1. Do not neglect to check that the line voltage applied to the motor controller is the same voltage for which the motor is wired.
2. Always follow motor manufacturer's specifications on bearing lubrication.
3. Do not attempt to operate a motor that is overheated due to frequent starts and stops. Allow the motor to cool to ambient temperature (as designated on the motor nameplate) before each restart.

G. ELECTRICAL (General)

1. Install and ground all equipment (permanent and portable) in accordance with requirements of the National Electric Code and local electric codes.
2. Use circuit breakers or fused disconnects between equipment and power source.
3. Never touch electrical components with wet hands or when standing on a wet surface. Insulate yourself from ground and use insulated tools.
4. When handling electrical equipment, take care to avoid contacting live parts. Assume all circuits are live. Check with a voltmeter.
5. Label all control circuits clearly.
6. Keep electrical controls and motors clean and free of dust – dust prevents thorough air circulation, generating heat; heat in turn can ignite the dust or flammable vapors if present in the atmosphere.
7. Never wash electrical equipment unless it is constructed for that purpose. Never wash live electrical equipment.

H. ELECTRICAL (Repairs)

1. Only qualified personnel, familiar with electrical safety procedures and the construction and operation of the equipment, should work on electrical equipment.
2. De-energize all power before opening any electrical enclosure, or before connecting and disconnecting test equipment and components. Provide a safety lockout at the power source.
3. Use only approved safety rubber gloves and mats, insulated tools, and eye shields when doing electrical work.
4. Periodically inspect and operate all of the automatic shut-off devices and monitoring systems provided.
5. On DC powered equipment, do not perform any inspection (mechanical or electrical) until the power has been turned off and disconnected, and all rotating assemblies have come to a complete stop. The moving motor may generate DC voltage feed back.

I. CHEMICALS

1. If corrosive and/or toxic chemicals or solvents are used as part of the process or as cleaning materials: become thoroughly familiar with the properties of the products and their hazards, the precautions necessary to handle the product

safely, and follow all manufacturer recommendations for the type of product being handled.

- a. Use in well ventilated area and keep employee exposure below permissible limits.
 - b. If flammable, take care to prevent fire or explosion.
 - c. Avoid contact with the skin and eyes – wear goggles, gloves, shields, etc., as required by the nature of the solvent or chemical.
2. If in doubt whether a product is dangerous or not – Assume It Is. Take all necessary precautions to avoid personal injury.

J. VENTILATION

1. Toxic fumes, if present in the system, must not be permitted to escape to the operating area. They should be adequately vented away from the worker in accordance with applicable environmental regulations.
2. If in doubt whether any vapor is toxic or not – Assume It Is. Take all necessary precautions to avoid personal injury or adverse health effects. Worker exposure should be maintained below the permissible limit and at the lowest feasible level.
3. If it is necessary to enter an area where toxic vapors are present, consult with responsible authorities for recommendations concerning safety.
4. Use NIOSH approved breathing apparatus when working with toxic or hazardous materials, or with materials that reduce the oxygen concentration in the air, such as carbon dioxide.

K. COMBUSTIBLE PRODUCTS

1. If combustible products are used as part of the process or as cleaning products, become thoroughly familiar with the safety precautions necessary to handle the product. Follow all recommendations to avoid personal injury or property damage that could be caused by fire or explosion.

L. PRESSURE VESSELS

1. Vessels operating under internal pressure should be maintained and inspected in accordance with the manufacturer instructions and/or applicable local or state codes. If corrosion or erosion is expected, frequency of inspection should be increased. Qualified personnel should make all necessary repairs.
2. Vessels operating under internal pressure should be provided with a safety device to relieve excess pressure in accordance with the Unfired Pressure Vessels Code.
3. Safety devices should be in good operating condition at all times. It is recommended that they be inspected and tested frequently and maintained in accordance with manufacturer instructions and/or applicable local and state codes.

4. If any repair on a safety device is necessary, return it to the manufacturer. Inexperienced personnel should never attempt repair. Any adjustment should be made according to the recommendations supplied by the manufacturer.
5. The outlet connections of all safety devices should be installed in a manner that will not cause injury to personnel should discharge or actuation occur.
6. Before attempting maintenance on pressurized equipment, reduce internal pressure to atmospheric pressure.

M. HOT / COLD PRODUCTS

1. When working with very hot or very cold processes or products, extreme caution should be used to avoid personal injury.

N. LEAKAGE AND SPILLAGE

1. Any leakage in the system should be quickly corrected.
2. Any type of spillage (oil, water, etc.) should be quickly cleaned off floors, walls, equipment, lines, etc., and the entire operating area kept clean.

O. DANGEROUS MATERIAL APPLICATIONS

Hutchison Hayes, L. P. makes both standard equipment and equipment furnished with certain explosion-proof accessories (motor, controls, etc.), as specified by the purchaser. Standard equipment not furnished with explosion-proof accessories must never be used with explosive, chemically unstable, or flammable materials of any kind. Severe personal injury or property damage could result. When we supply equipment furnished with explosion-proof accessories, whether we are the manufacturer or not, we warrant that the particular accessories we describe as explosion-proof comply with accepted industry standards for that term. However, this does not mean, and we cannot and do not guarantee, that one of our machines furnished with explosion-proof accessories is safe for use with explosive, chemically unstable, or flammable materials under ALL conditions.

In some instances, it may be necessary for the user to equip the machine with safety devices not ordinarily placed on equipment of this type. In other cases, the application may be so hazardous that the only prudent operating procedure is to isolate the equipment in an expendable building and operate it by remote control from a safe distance. Because Hutchison Hayes, L. P. has no control over these potential dangerous operating conditions, we do not guarantee that equipment made by us can be safely used with explosive, chemically unstable, or flammable materials, regardless of whether we installed industry accepted explosion-proof accessories. The user has the responsibility for insuring that all precautions required by his particular method of operation have been taken.

P. REPAIRS

1. Do not make mechanical or electrical repairs or attempt disassembly unless the equipment has come to a complete stop, the power is shut off, and a safety lockout or other padlock is installed on the disconnected circuit. The locking device should be tagged to identify the working party.

2. Do not make any repairs until dangerous vapors and gases are replaced with clean air.
3. Hutchison Hayes, L. P. should be consulted before attempting to make major repairs to any of the rotating equipment we manufacture. Under no circumstances should weld repair or other alterations be made to major rotating components without the full knowledge and assistance of qualified Manufacturer personnel. Failure to obtain this assistance may result in rupture of parts involved with possible injury to personnel or damage to equipment.
4. Repairs to hard-surfaced parts must be performed with strict quality control of materials and methods. Hard-surfacing materials are brittle, and can break off if improperly applied. After startup, periodic inspection of these parts is necessary to anticipate separation of materials.
5. During repairs, when equipment may be physically or electronically unstable, post barriers or signs announcing hazardous conditions.
6. After repairs and before restarting, reinstall all guards and reconnect all mechanical and electrical safety devices.

Q. CORROSION, EROSION, AND PITTING OF ROTATING EQUIPMENT

1. To insure a high factor of safety under severe operating conditions, high speed rotating equipment manufactured by Hutchison Hayes, L. P. is designed after a careful stress analysis has been made of highly stressed parts. A thorough control of metallurgical properties is maintained throughout manufacture, and all material is warranted as free of defects at time of shipment.
2. It should be noted that equipment subjected to severe erosive or corrosive environment could deteriorate over a period of time, depending on the severity of the exposure and/or possible misuse. Users of high speed rotating equipment should be aware of the fact that extremely high forces are brought into play when their equipment is in operation. Any weakening of highly stressed members by misuse, erosion, corrosion, chemical pitting, or stress cracking must be guarded against to prevent possible metal failure.
3. In the interest of longer and safer operation of the equipment, Hutchison Hayes, L. P. recommends that the equipment owner maintain a periodic (at least monthly) inspection on highly stressed rotating and/or moving parts which are subjected to erosive or corrosive wear.
4. The following points should be noted and the recommended action taken:
 - a. Do not operate equipment when:
 1. Holes are wearing through rotating and/or moving parts.
 2. Grooves greater than 1/16" deep are worn in rotating and/or moving parts.
 3. Evidence of cracks is present, especially in rotating and/or moving parts.
 4. Chemical pitting of 1/16" depth or greater on rotating and/or moving parts.
 5. Component surfaces are covered with a light corrosion or etching.
 - b. Chemical pitting is observed:

All cases of chemical pitting, even less than 1/16" depth, should be watched carefully. This pitting action is almost always due to the breakdown of the passive film on stainless surfaces in the presence of chlorides. This often occurs under product cake that has not been sufficiently cleaned from the surface. High temperature, low pH, and high acidity accelerate the pitting action.

5. Contact Hutchison Hayes, L. P. regarding the repair or replacement of rotating and/or moving parts whose surface is noticeably pitted.

INSTALLATION

Location

- a. Install the centrifuge unit in a location where sufficient headroom is allowed for lifting the bowl out of its frame enclosure.
- b. A 2-ton overhead hoist should be installed to facilitate inspection or repair work.
- c. A clear area in the vicinity of the centrifuge should be provided to set the bowl during inspection or repair.
- d. Room should be allowed at the *front end* of the machine for withdrawing the planetary gearbox. A zone approximately 2'0" wide x 2' 6" long from the front end of the gearbox should be kept clear.
- e. Room should be allowed at the *rear end* of the machine for withdrawing the feed tube. A zone approximately 6" wide x 3' 0" long from the end of the feed tube support clamp should be kept clear.
- f. Clear access space should be provided around the centrifuge.
- g. The centrifuge isolators should set on a smooth level surface on structural members of sufficient strength.

IMPORTANT CAUTION

Since this centrifuge operates at high speed and is subjected to severe wear conditions, it is important that any indications of weakening of highly stressed components be recognized before a failure can occur.

To facilitate this HH recommends a *monthly* visual inspection on highly stressed components, such as:

The bowl
Shafts
Wear plates
Wear tiles
Conveyor, etc.

If inspection reveals:

1. Holes worn through moving parts
2. Wear grooves greater than 1/16" thick in moving parts
3. Cracks present in moving parts
4. Chemical pitting to a depth of 1/16" or greater in moving parts

DO NOT OPERATE THE EQUIPMENT UNTIL REPAIRS ARE MADE

**FAILURE TO FOLLOW THE ABOVE RECOMMENDATIONS MAY RESULT
IN SEVERE PERSONAL INJURY OR PROPERTY DAMAGE**

PIPING

1. Customer piping tie-ins to the centrifuge should be made with flexible connections.
2. Customer tie-in at feed tube should have a suitable pipe support so that no weight is imposed on the centrifuge feed tube.

A flexible connection is required here.

3. A flush line should be provided at the feed tube tie-in. HH recommends hot water.

A ball valve should be located as close as possible to the feed line to prevent plugging the flush branch with solids.

4. Use a screen at the pump suction to protect the pump and centrifuge from oversize solids.
5. Liquid discharge lines should have a minimum of $\frac{1}{4}$ " per ft. slope.
6. HH recommends installation of a pressure indicator in the feed line upstream of the customer tie-in to regulate the feed supply to the centrifuge.

For HH 1448 centrifuges with **Hydraulic Main Drive or Hydraulic Back Drive**, the following hydraulic oil is recommended: MOBIL DTE 26.

(See the Product Data Sheets on the following pages.)

Caution: Other hydraulic oils should only be used with written confirmation that the oil conforms to the specifications on the MOBIL DTR 26 product.

PRESTART SAFETY PRECAUTIONS

FAILURE TO FOLLOW THE RECOMMENDED SAFETY PRECAUTIONS LISTED BELOW MAY RESULT IN SEVERE PERSONAL INJURY OR PROPERTY DAMAGE

Read through this entire list before attempting start-up

Initial Installation

1. The correct bowl rotation must be verified. The bowl should rotate clockwise when viewed from the motor end (rear of centrifuge) looking inboard.
2. The drive group enclosure guard and the gearbox shroud must be secured in place.
3. Check to see that the centrifuge unit is clear of rags, ropes, wires, or any other material which could catch or snag rotating parts.
4. All bolts and capscrews must be engaged per recommended torque requirements shown in Charts 1 and 2 at the end of this section.
5. All rings and seals should be in good condition and securely fastened.
6. The centrifuge cover should be tightly secured.
7. The frame bolts should be fully tightened.
8. Check all lubrication points. (See Lubrication Section)
9. Verify that all seal fittings at explosion-proof motor and control are sealed with CHICO X Fiber and sealing compound.
10. The drive belt should be checked for correct tension. *Caution:* Over tightening belts can damage the fluid coupling. (See Figure 1 at the end of this list.)
11. Electrical grounding straps must be secured in place, where required.
12. Maximum Speed, specific gravity, or pressure, indicated on the centrifuge name plate is not to be exceeded.
13. No work is to be performed on the electrical system unless the power is shut-off.
14. Check the line voltage on initial start-up to ascertain that the voltage applied to the motor controller is the same voltage that the motor is wired for.
15. If excessive vibration is present during start-up, shut the unit down immediately and notify HH service representative.

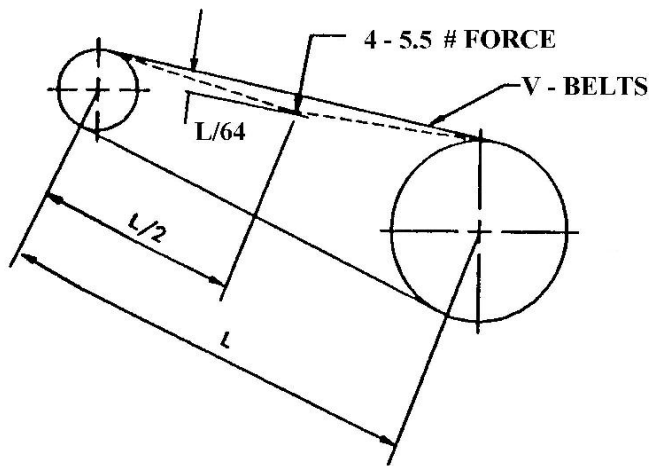
16. Do not replace any damaged or worn out ***Machine Parts*** with other than HH replacements.
17. The customer may replace ordinary wear parts such as oil seals, o-ring and gaskets. A replacement list is in the Parts List Section.
18. Do not open the cover or attempt removal of a shroud or belt guard until the centrifuge is motionless.
19. Use the correct tools for any assembly or disassembly work.
20. Do not supply slurry into the centrifuge until the unit is fully up to normal operating speed.
21. If more than one (1) centrifuge is in operation, never attempt to exchange any machined parts.
22. Never use a pipe wrench on any part of the centrifuge.
23. There is a slow down period as the machine decelerates towards shut-down. Leave the cover shut until the centrifuge is motionless. Do not attempt any disassembly before the machine is static.
24. Never prop the centrifuge cover partially open by using blocks of wood or any other foreign object.

IMPORTANT CAUTION

25. Whenever the centrifuge cover is opened for cleaning, inspection, etc., the one (1) hinge safety pins must be engaged to prevent accidental closing of the cover, this procedure should ***always*** be followed.
26. Flexible connections should be used at all customer piping tie-ins.
27. Do not attempt any repairs to the gearbox at the front of the machine beyond replacement of the pinion shaft oil seal.

1448 HIGH "G" CENTRIFUGE BELT TENSIONING PROCEDURE

FIGURE 1.



Remove Belt Guard

Measure Distance "L" in inches.

Divide by 64.

Force required to deflect belt = 4 to 5.5 Lbs.

Caution:

Do not over-tighten belts

START UP AND SHUT DOWN

1. Read through Pre-Start Safety Precautions.
2. Momentarily press the motor start button. The centrifuge will come up to full operating speed in two (2) to three (3) minutes.
3. Start the feed pump and open the feed supply valve.

The Torque Control Limit Switch is interlocked with the Motor Control and will stop the motor if the conveyor becomes overloaded.

4. Check solids for dryness, and the liquids for clarity.
5. If the solids are too wet, or liquids are not clear enough, the four (4) Plate-Dams will have to be adjusted. Stop feed pump and centrifuge and go to operation section for information on Plate-Dam adjusting.
6. To shut down, slow the feed rate to 10 gallons per minute.
7. Push the stop button for the feed pump.
8. Start the flush water and continue to run centrifuge for five (5) minutes to clear any product still in the bowl.
9. Stop centrifuge and let it come to a complete rest before turning off flush water.
10. Once a week, manually trip the torque control linkage to verify that it is operating smoothly.
11. The centrifuge should be cleaned after each shutdown. (See Cleaning Bowl Section)
12. Never reach into a shrouded area while the centrifuge is running.



SECTION 3

OPERATION

OPERATION

The slurry to be separated is pumped into the feed tube, axially located at the rear of the machine.

The slurry is directed into a feed chamber where it is dispersed by four (4) externally mounted feed nozzles and directed by centrifugal force along and against the inside wall of the bowl.

This ring of slurry or “pond” will contain solids against the bowl wall. These solids are scrolled forward over a “beach area” by the screw conveyor and discharged through four (4) ports at the solids end of the centrifuge located in the rear.

The lighter liquids migrate forward and are discharged through four (4) adjustable plate dam nozzles at the liquids discharge area located at the front end of the centrifuge; i.e. the gearbox end.

OVER-TORQUE PROTECTION

A TORQUE CONTROL DEVICE is located at the front of the gearbox. If a predetermined torque limit on the screw conveyor is reached during operation, the device will trip and close a micro switch sending a signal to cut off the feed supply. This protects the screw conveyor and the gearbox from over-torque damage.

A torque arm, contacting a rub pad on a trip lever is held in balance by means of a spring loaded cylinder linkage.

If the pre-set torque limit is exceeded, this torque arm will rotate the trip lever out of the way and the torque arm will rotate at the same RPM as the bowl.

When this happens, no solids can be conveyed to the solids discharge ports. The spring loaded cylinder linkage will have tripped, and caused the feed to stop so no further accumulation of slurry can occur.

When the torque-control device trips:

- a. ***Stop the centrifuge.***
- b. Remove the gearbox shroud.
- c. Rotate the torque-arm ***clockwise by hand*** to determine if the screw conveyor is stopped by an accumulation of solids or debris.
- d. Replace the gearbox shroud and restart the centrifuge.
- e. If the gearbox rotates, the conveyor is blocked and will need cleaning. If the gearbox does not rotate but the centrifuge trips out immediately after restart, ***the bowl must be cleared by cleaning.***

WARNING

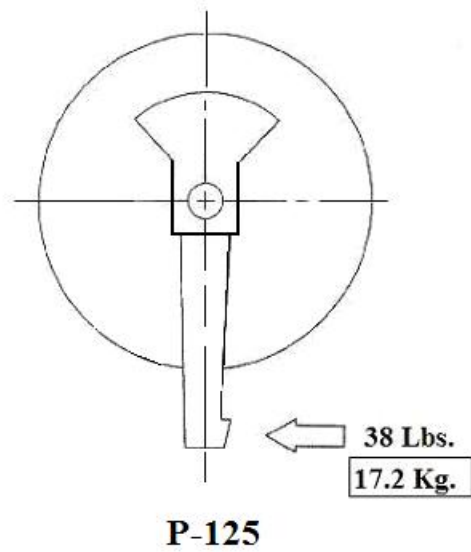
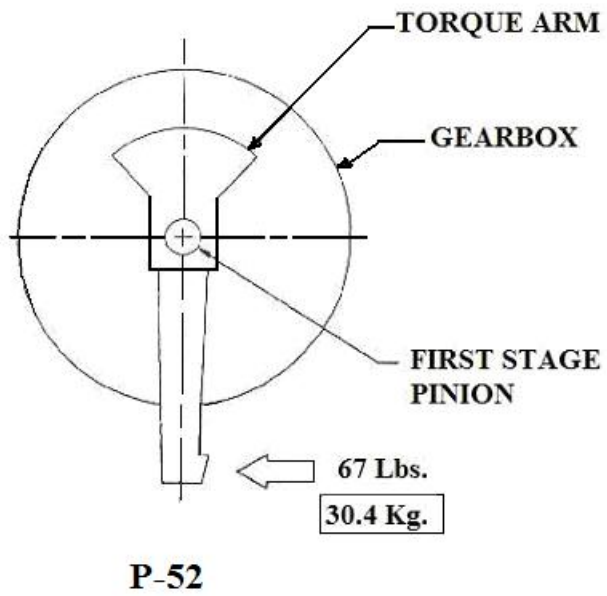
SUDDEN HIGH SPEED ROTATION OF THE TORQUE ARM

An aluminum torque arm is externally mounted on the planetary gearbox first stage pinion shaft. This part faces against the pivot arm (lever) which when tripped through a spring-loaded compression link, mechanically operates a micro-switch causing motor shutdown. This happens if the centrifuge conveyor becomes jammed or locked-up and rotates the bowl.

This aluminum torque arm, item 950 normally is stationary. However, ***it can come up to the bowl/gearbox rotating speed instantaneously without warning*** in the event of a conveyor jam.

It is important that all operating personnel understand this hazard and at all times keep clear from this torque arm while the centrifuge is running.

TORQUE SPRING SETTING 1448 CENTRIFUGE



CLEANING BOWL WHEN PACKED OFF

1. Flush the bowl with water before shutting down
2. When the bowl is flushed, stop the machine but continue flushing.
3. Rotate the bowl by jogging the motor.
4. If necessary open lid and install lock out pin to rotate bowl by hand in forward and reverse direction.

CAUTION: When rotating bowl in reverse direction it is important to be aware that there is no torque protection or break over mechanism for the gearbox. Do not over rotate bowl in the reverse direction. Damage may occur to gearbox.

NOTE: Rotating each way while flushing will move some solids to the liquids discharge and some flushing liquid to the solids discharge.

If this is a problem, arrange to divert the liquids and solids discharge ***before*** cleaning.

If cleaning does not remove solids deposits, the bowl will have to be pulled for inspection and further cleaning. Go to Disassembly Section.

PLATE DAMS ADJUSTMENT

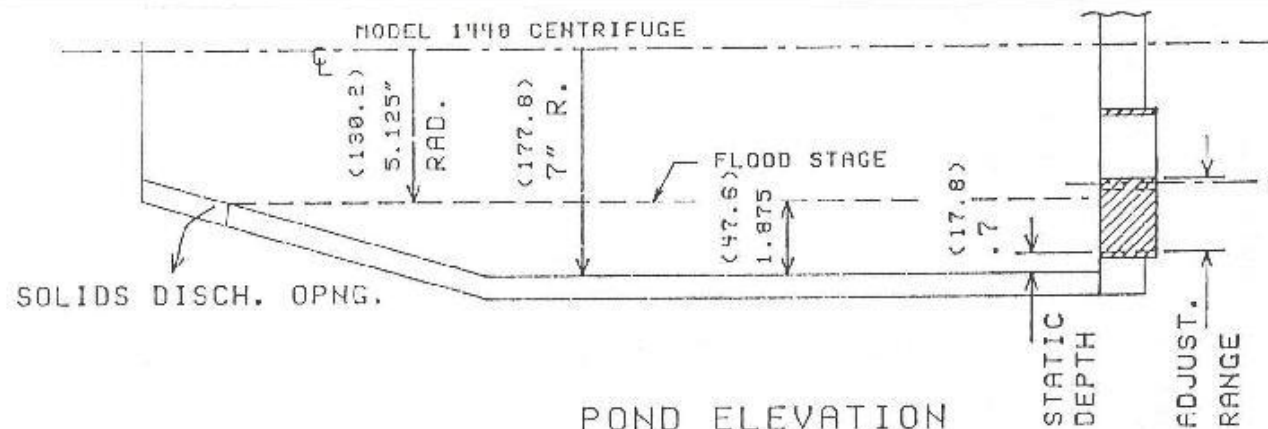
1. The four (4) plate dams are used to set the “Pond” depth.
2. The plate dams are located in the front hub. Access to the plate dams is allowed by raising the centrifuge cover with the machine shut down.
3. The plate dams are adjusted by loosening six (6) capscrews and rotating the plate clockwise.
4. A Maximum Setting, (i.e., the highest number engraved on the plate aligned with the arrow mark on the front hub) will cause ***a maximum pond depth*** giving maximum clarification of the liquid.
5. A Minimum Setting (i.e., the lowest number engraved on the plate aligned with the arrow mark on the front hub) will cause ***a minimum pond depth*** and will result in the ***Maximum dryness of the discharged solids.***

IMPORTANT

6. When plate dams are indexed by rotation, all four (4) dams must be indexed to the same number.
7. After adjusting, always recheck all twenty four (24) capscrews for correct tightness.

SETTING		POND DEPTH		VOLUME		SETTING		POND DEPTH		VOLUME	
		(IN)	(MM)	(GAL)	(LITERS)			(IN)	(MM)	(GAL)	(LITERS)
(MIN.)	1.0	0.70	17.8	5.15	19.51	3.1	1.16	29.5	8.51	32.21	
	1.4	0.72	18.3	5.3	20.06	3.2	1.22	30.9	8.94	33.86	
	1.5	0.80	20.3	5.89	22.20	3.7	1.42	36.1	10.39	39.31	
	2.0	0.90	24.9	7.2	27.26	4.0	1.55	39.4	11.32	42.83	
	2.6	1.00	25.4	7.35	27.81	4.3	1.68	42.7	12.24	46.33	
	2.7	1.05	26.7	7.71	29.19	4.4	1.70	43.2	12.38	46.87	
	3.0	1.10	27.9	8.07	30.56	4.5	1.98	47.75	13.6	51.48	
						(MAX.)					

NOTE: DISREGARD SETTINGS
4.9, 5.5 & 6.8 THEY ARE
BEYOND THE WORKING POOL
DEPTH RANGE.



UNLESS NOTED OTHERWISE:

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SECTION 4

LUBRICATION

RECOMMENDED LUBRICATING GREASE FOR THE 1448 CENTRIFUGE

CHEVRON SRI-2 or MOBIL SHC 220

Lubrication fittings are located at the pillow block housing (front and rear) and on the front and rear hub shafts for conveyor bearing lubrication.

NOTE: The conveyor bearing grease fittings are located inside the machine frame, and the cover must be opened to gain access to the grease fittings.

NOTE: Pillow block and conveyor bearings are shipped from our manufacturing plant properly filled with grease.

SYNERGY™ HIGH PERFORMANCE GEAR OIL

SYNERGY is an ultra-tough, multi-service gear oil designed to smoothly lubricate all types of gears under all conditions. Synergy outperforms other E.P gear oils because it contains Synslide™, our proprietary synthetic oil film so tough and tenacious it is not squeezed out of the pressure area. It virtually eliminates both gear and bearing wear – even under severe “squeeze film” conditions caused by extremely high loads, sudden shock loads, or low Rpm's. Slippery synthetic molecules increase the lubricity and oiliness of SYNERGY. Gears run smoother, quieter, cooler and longer without overhauls. SYNERGY is non-corrosive to both ferrous and non-ferrous metals. Its ability to separate rapidly and completely from water prevents sludge and wear found in wet gear boxes (such as cooling tower gear boxes). SYNERGY employs a unique, dense, high molecular weight synthetic cushioning additive to prevent fatigue failure in gears subjected to sudden loads.

SYNERGY'S exclusive performance advantages:

- Severe Service – performs under loads where other E.P. gear oils fail
- Lower Coefficient of Friction – saves energy and reduces temperatures
- High Temperature Performance – eliminates harmful deposits – extends oil drains
- Cushioning Molecules – reduces fatigue failures in bearings and gears
- Environmentally Safe – non-toxic as all components are on TSCA's approved list and fully comply with all OSHA and EPA guidelines
- Synslide™ - proprietary, slippery, tenacious, ultra-tough synthetic film
- Prevents Corrosion – protects both ferrous and non-ferrous metals during operation and shut-down
- Water Separation – complete separation of oil and water to prevent emulsion
- Compatibility – 100% compatible with both mineral and synthetic gear oils

Customer Benefits:

- Saves Money – Saves energy, extends gear box life and reduces down-time
- Multi-Applications – one oil for all gears – spur, helial, herringbone, worm, etc.
- Multi-Conditions – for all speeds, all horsepower, all loads and all temperatures
- Superior Lubrication – smoother, quieter, cooler, more efficient gear boxes

Recommended For:

- All Gear Boxes – regardless of type, horsepower, speed, load or temperature
- All Metals – non-corrosive to both ferrous and non-ferrous metals
- All Service – shock load, high pressure, high and low temperature
- All Users – ready for a quantum leap in gear box performance



Beyond Synthetic™

Synfilm® GT is recommended for use in gas and steam turbines, pumps, bearings, gears, air tools, etc. Synfilm® GT should be considered instead of Synfilm® when oil reservoir temperatures exceed 200°F, improved low temperature fluidity is desired or when a viscosity grade is not available in Synfilm®.

Synfilm® GT is a long life, high film strength, energy efficient, synthetic lubricant that significantly increases bearing life and equipment reliability. Synfilm® GT gains its performance advantages over competing mineral and synthetic oils through its superior blend of synthetic base oils plus Royal Purple's proprietary Synerlec® additive technology. This unique additive technology is proven to make equipment run smoother, cooler, quieter, longer and more efficiently.

Synfilm® GT typically replaces conventional, low film strength, R&O (rust and oxidation inhibited) oils that rely solely on their viscosity to protect equipment against wear.

Synerlec® additive technology makes the difference!

Synthetic oils enable Royal Purple to make superior lubricants, but it is Royal Purple's advanced Synerlec® additive technology that gives Royal Purple's lubricants their amazing performance advantages. Synerlec® additive technology truly is *beyond synthetic*™.

Synerlec® additive technology forms a tough, slippery, synthetic film on all metal surfaces. This proprietary film significantly improves lubrication: first, by increasing the oil's film thickness, and second, by increasing the oil film's toughness, both of which help to prevent metal-to-metal contact. It displaces moisture from metal surfaces and protects all metals against rust and corrosion. It also fortifies the oil against the detrimental effects of heat, which causes oil to oxidize.

Exclusive Performance Advantages:

- **High Film Strength**
Synfilm® GT protects bearings far beyond the ability of other turbine oils, carrying up to 700 percent greater loads.
- **Rapidly Separates from Water**
Synfilm® GT rapidly and completely separates from water, which is easily drained from the bottom of the oil reservoir.
- **Saves Energy**
Synfilm® GT has an extremely low coefficient of friction that is proven to save energy over conventional oils. In rotating equipment these savings frequently exceed the total cost of the oil within several months, making what was once an oil expense a profit.
- **Extremely Clean**
Synfilm® GT is packaged in new poly containers, has a typical ISO 4406 Cleanliness Level of 14/13/11 (ISO 32, 46 and 68 only) and is verified by a laser particle counter. This is up to 250 times cleaner than other new oils delivered in steel drums or by bulk delivery.
- **Reduces Bearing Vibrations**
The tough oil film of Synfilm® GT coupled with its ability to micro-polish contacting bearing elements provides superior bearing lubrication.
- **Longer Oil Life**
Synfilm® GT has outstanding oxidation stability that greatly extends oil change intervals while keeping equipment clean.
- **Excellent Corrosion Protection**
Synfilm® GT's tough oil film forms an ionic bond on metal surfaces, which acts as a preservative oil during shutdown and provides instant lubrication at startup.
- **Synthetic Solvency**
Synfilm® GT's natural solvency cleans up dirty equipment and keeps it clean.
- **Compatible with Seals**
Synfilm® GT has excellent seal compatibility.
- **Compatible with Other Oils**
Synfilm® GT can be mixed with other mineral oils and most synthetic oils. (It is not compatible with silicone or glycol synthetics.)
- **Environmentally Responsible**
Synfilm® GT components are TSCA listed and meet EPA, RCRA and OSHA requirements. Synfilm® GT extends oil drain intervals, eliminates premature oil changes, decreases the amount of oil purchased and disposed of and conserves energy.

Typical Properties*	ISO Grade / AGMA Grade										
	10	22	32	46	68	100	150	220	320	460	680
AGMA Grade	—	—	—	1	2	3	4	5	6	7	8
Viscosity											
cSt @ 40°C	10	22	32	46	68	100	150	220	320	460	680
cSt @ 100°C	2.6	4.5	5.8	7.4	9.9	12.6	16.8	21.9	28.2	34.1	45.7
SSU @ 100°F	61	115	185	236	350	518	780	1151	1685	2445	3632
SSU @ 210°F	35	41	46	51	60	70	87	110	139	166	222
Viscosity Index	105	118	126	126	128	120	120	120	119	110	114
Flash °F	375	440	480	520	495	490	490	500	500	500	500
Pour Point °F	-73	-80	-80	-75	-65	-45	-45	-35	-30	-30	-30
ISO Cleanliness Level	**	**	14/13/11	14/13/11	14/13/11	N/A	N/A	N/A	N/A	N/A	N/A
ASTM D-1401 Demulsibility (from 40/40/0/6 to 40/40/0/30)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
D-892 Foam Tests Sequence I, II, & III	—	—	—	—	—	—	—	—	—	—	—
D-130 Copper Corrosion 3 hrs. @ 210°F	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A
250 hrs. @ 210°F	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A
Cincinnati Millicron "A"											
72 hrs. @ 275°F	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
D-665 Rust Test											
Fresh Water	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Salt Water	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
D-2893 Dry Air Oxidation 312 hrs. @ 203°F											
% Viscosity Increase	0	0	0	0	0	0	0	0	0	0	0
Precip. No. (% Solids)	0	0	0	0	0	0	0	0	0	0	0

*All properties are typical and may vary.

**Check with manufacturer regarding availability with 14/13/11 cleanliness.

FILM® GT's solvency cleans wear metals and deposits left behind by previous oils. These wear metals and deposits can become soluble in the new oil, causing abnormal values on used oil analysis until equipment is clean.

**Hutchison Hayes 1448 Centrifuge
Lubrication Schedule**

	Frequency	Lubricant
Pillow Block Bearings:	24 Hrs Run Time 2 Shots per fitting	Chevron SRI-2 Mobil SHC-220
**Conveyor Bearings:	15 Days Purge till relief	Chevron SRI-2 Mobil SHC-220
Gearbox:	First Oil Change after 500 hrs. of operation, then every 6 months.	Royal Purple Synergy Gear Oi ISO Grade 150 SAE 90 AGMA Grade 4EP
Torque Control Linkage:	6 months	NEVER-SEEZ Compound
Fluid Coupling:	“FORMSPRAG” Model	12.4 HSD
	ABOVE 130 DEG. F	SAE 10W Fyrquel 550 Houghto Safe 1010
138 Fl. Oz. Cap. (fill#11) Change oil every 4000 hrs. For fire resistant fluid, every 10,000 hrs. or every two (2) years.		
	BELOW 130 DEG. F.	SAE 5W Fyrquel 90 Houghto safe 1010 Pydraul 29E LT

(See Vendor Section of this manual for complete filling instructions)

**** After every washing or steam-cleaning of the conveyor,
check the conveyor bearing lubrication.**



SECTION 5

ASSEMBLY AND DISASSEMBLY

GEARBOX REMOVAL

STEPS:

- 1. Follow all lock out and tag out safety procedures. Insure power is off to the unit.**
2. Remove gear guard from unit.
3. Loosen the torque arm setscrew.
4. Slide the torque arm off of the pinion shaft.
5. Manually trip the torque mechanism.
6. Place a sling (held by the overhead hoist) under the gearbox.
7. Remove the six (6) adaptor hub screws.
8. Using two (2) of the cap screws just removed; jack the gearbox out of the adaptor hub.
9. With the sling carrying the gearbox weight, carefully withdraw the gearbox and set it on its' side in a clean, clear area.

***DO NOT ATTEMPT TO DISMANTLE THE GEARBOX. A DAMAGED GEARBOX
MUST BE RETURNED TO HH FOR REPAIRS.***

ROTATING ASSEMBLY REMOVAL

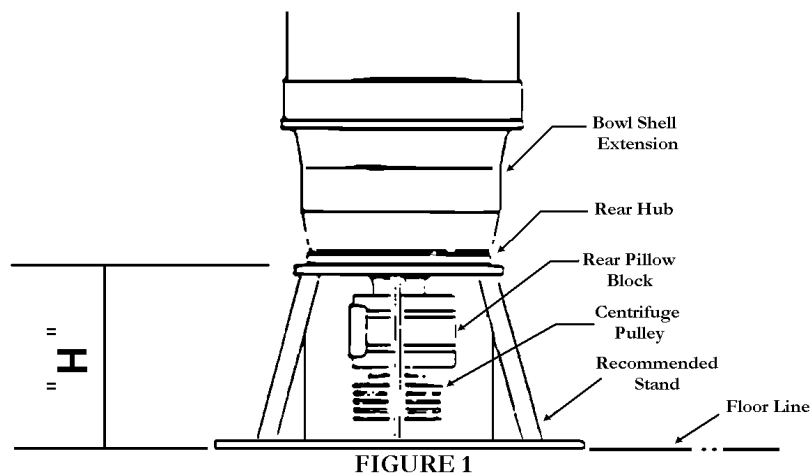
STEPS:

1. Remove gearbox shroud by removing four (4) capscrews and slowly lifting vertically.
2. Carefully remove the drive group enclosure.
3. Remove drive belt by moving the motor toward towards the centrifuge using the Nema adjust motor base to slacken the belt. (The adjusting bolt is 3/ 4", 1-1/ 8" across the hex flats.)
4. Disconnect the feed-line to centrifuge.
5. Untighten feed tube clamp by loosening four (4) bolts. Do not remove feed tube clamp cover.
6. Remove feed tube. It pulls straight out.
7. Remove the front and rear pillow block dowel pins by jacking them out using the threaded connection at the top of the pins to withdraw them.
8. Remove pillow block bolts.
9. Fully open centrifuge cover and secure one (1) safety latch pins.
10. Using hardened capscrews, attach bowl lift lugs at front and rear of bowl.
11. Using the bowl spreader-bar, attach shackles to lifting lugs and slowly lift the bowl and gearbox assembly (if gearbox has not been removed before this) assembly as a unit, using the 2-ton overhead hoist.
12. Set the assembly down horizontally in a clean clear area.

CONVEYOR REMOVAL

Positioning bowl for conveyor removal (After the gearbox has been removed)

1. With bowl assembly now sitting horizontally in a clear, clean work area, remove the bowl spreader bar.
2. Attach the conveyor lifter to the adaptor hub (at gearbox end of centrifuge) using four (4) 7/16 – 14 UNC X 2 3/4” long bolt with heavy hex head nuts. The gearbox must be removed prior to this procedure.
3. Place the bowl assembly on a support stand as shown in Figure 1.



4. Height “H” in diagram must be tall enough so the drive sheave (pulley) clears the floor by at least two (2) inches.

CAUTION: Never allow the drive shaft to contact any surface during this lifting procedure. It is not designed to carry any load and can easily be damaged.

5. The weight must be carried through the rear hub resting on the stand.

With the bowl assembly now resting securely in an upright position:

6. Remove the twelve (12) 3/8” / capscrews from the front hub at top end of the bowl assembly.
7. Using four (4) bolts just removed, screw them into the four (4) jackscrew holes and remove the hub.
8. Once the front hub is jacked free, it can be lifted out with the overhead hoist.

9. Set this front hub, pillow block, and gearbox adaptor hub assembly in a clean, clear space.
10. Unbolt the **Conveyor Lifter Plate** from the gearbox adaptor hub just removed.
11. Remove two (2) capscrews from the seal housing at the end of the conveyor and attach the **Conveyor Lifter Plate**.
12. Slowly hoist out the conveyor.
13. Set the conveyor upright on a smooth, clean and clear work area.
14. With the hoist still attached to the conveyor, secure the conveyor assembly with ropes so it cannot topple over.
15. Once secured, disconnect the hoist connection and remove the Conveyor Lifter Plate.

CONVEYOR DISASSEMBLY FRONT CONVEYOR BEARING REMOVAL

1. If the front conveyor bearings are in good condition, they do not need to be pulled. Disregard Steps 2, 3 and 4 and go to Step 5.
2. If the Front Conveyor Bearings are worn out or damaged, remove the four (4) capscrews from the liquids and seal housing.
3. Jack out the liquids end seal housing using two (2) capscrews just removed.
4. Using a slide hammer type bearing puller, remove the two (2) bearings.
5. Remove the Conveyor Bearing Housing by removing the eight (8) capscrews and jacking it out using two (2) of the removed capscrews.

This opens the end of the Conveyor Tube and allows access to the Accelerator Plate and Feed Chamber Liner.

ACCELERATOR PLATE AND FEED NOZZLES

1. The accelerator plate is removed by inserting the long T-handle wrench into the conveyor tube and screwing it tightly into the threaded hub on the centerline of the accelerator plate.
2. With the T-handle wrench * attached firmly, loosen the two (2) 3/8' setscrews and the two (2) 3/8' lockscrews from the conveyor tube. They are located just forward from the feed nozzle located on the outside of the conveyor tube.
3. With the setscrews and lock screws backed-off enough to allow the plate to be pulled out, slowly withdraw the accelerator plate.

4. Remove the four (4) externally mounted feed nozzles by unscrewing two (2) capscrews at each nozzle and withdrawing each nozzle by gripping its' flange and pulling it out.

5. Note the condition of the O-Ring on each feed nozzle.

* T-handle wrench (available from HH)

CONVEYOR REAR BEARING HOUSING REMOVAL

1. Remove the conveyor as per the previous **Conveyor Removal Section**, but set the conveyor in a horizontal position on a clean, clear work surface.
2. Remove the conveyor lifter plate from the front of the conveyor.
3. Carefully raise the conveyor to **a vertical position** with the front end (gearbox end) resting on a very clean surface.
4. Remove the rear bearing seal housing by unscrewing the six (6) 5/ 16" capscrews.
5. Using two (2) of the screws just removed, place them in the two (2) jackscrew locations and evenly jack the solids-end bearing seal housing (Item 11) out.
6. Inspect the two (2) oil seals, and the O-Ring for any damage. If damaged or worn, remove them.
7. Inspect the ball bearing. If it is in good condition go to Step 10.
8. If the bearing must be replaced due to wear or damage, reinsert the six (6) capscrews in the rear bearing housing to stabilize it for pulling the ball bearing.
9. Use a slide hammer type bearing puller to extract the bearing.
10. Remove the six (6) capscrews from the rear bearing housing and using two (2) of them, jack-out the bearing housing, the retainer tube assembly will come out with the rear bearing housing. *
11. Remove the six (6) capscrews from the retainer tube flange.
12. Pull the retainer tube assembly out.
13. Inspect the front oil seals for wear or damage.
If the front oil seals are worn or damaged, they will have to be replaced.
14. To replace the two (2) front oil seals, the bearing must be pulled.
Replace the rear bearing housing into the conveyor and replace the six (6) capscrews.
15. Remove the ball bearing using a slide hammer type bearing puller.

16. Remove the oil seal retaining ring.

17. Pull the two (2) oil seals and replace them.

18. Remove the rear bearing housing.

Now access is clear for removal and inspection of the retainer tube seal.

*** NOTE: Not all units have retainer tubes.**

Part Numbers
Hutchison Hayes 1448 Centrifuge
HH Machined Components

Item No.	Description	HH Part No.	Quantity
1	Bowl	03150	1
1A	Bowl Liner	03141	1
2	Bowl Extension	03151	1
3	Conveyor	03154	1
4	Conveyor, Extension	03155	1
5	Solid Flighting Tile	03402	Varies
6	Pillow Block Flinger	03166	4
7	Pillow Block Flinger Cover, Inner	03167	2
7A	Pillow Block Flinger Cover, Outer	03177	2
8	Bearing. End pl. Inner @ Pillow Block	03188	4
9	Seal Housing @ Centrifuge Sheave	03160	1
10	Rear Hub Assembly	03153	1
11	Conveyor Bearing Housing (Solids End)	03185	1
12	Conveyor Bearing Seal Housing (Solids End)	03157	1
13	Retainer Tube	03129	1
14	Case Flinger	03516	2
15	Pillow Block Housing	03187	2
16	Gearbox Spline Adapter	03186	1
17	Centrifuge Sheave (5.75" O. D.)	03182	1
18	Pillow Block Spacer Ring	03163	2
19	Dowel Pin, 2/ Pillow Block	03148	4
20	Feed Tube Assembly	03108	1
21	Accelerator Plate Assembly	03159	1
22	Feed Nozzle Assembly	03172	4
23	Wear Liner @ Feed Nozzle	03406	4
24	Solids Discharge Wear Insert	03173	4
25	Wear Inserts (Set 4-L, 4-R)	03173	8
26	Wiper Plows, Bowl (Set of 2)	03174	2
27	Drive Sheave, Motor (2450 RPM)	03161	1
28	Drive Sheave, Motor (3250)	03162	1
29	Conveyor Bearing Housing, Liquid End	03184	1
30	Front Hub Assembly, Liquid End	03152	1
31	Seal Housing, Liquids End	03158	1
32	Plate Dam	03476	4
33	Gear Flange	03183	1
34	Vibration Isolator	03178	*
35	Dowel Pin, 2/Pillow Block	03148	4

*** 4 Required (Base Machine)**

6 Required (Floormount Machine)

6 Required (Oilfield Skid Machine)

Bearings
Customer Replaceable Items

Item No.	Description	HH Part No.	Quantity
36	Rear Pillow Block Bearing	03169	1
37	Front Pillow Block Bearing	03168	1
38	Conveyor Bearing (Solids End)	03170	1
39	Conveyor Bearing (Liquids End)	03181	2

Oil Seals
Customer Replaceable Items

Item No.	Description	HH Part No.	Quantity
40	Oil Seal Solids End Bearing Housing	03135	2
41	Oil Seal, Solids End Seal Housing	03136	2
42	Oil Seal, Liquid End Seal Housing	03137	2
43	Oil Seal, Centrifuge Sheave Seal	03138	1

All Seals Good For 300 F.

Gaskets
Customer Replaceable Items

Item No.	Description	HH Part No.	Quantity
44	Gasket, Dam Plate (Set of 4 Required)	03149	4

O-Rings
Customer Replaceable Items

Item No.	Description	HH Part No.
45	O-Ring, Feed Tube	03189
46	O-Ring, Feed Nozzle	03190
47	O-Ring, Rear Seal Housing	03191
48	O-Ring, Front Seal Housing	03192
49	O-Ring, Accelerator Plate	03193
50	O-Ring, Front Seal Housing Outer	03194
51	O-Ring, Bowl Extension & Liquid Head	03195
52	Retaining Ring, Front Seal Housing	03197
53	Retaining Ring, Rear Seal Housing	03196

**Grease Fittings
Customer Replaceable Items**

Item No	Description
54A	Grease Fitting, Non-Corroding 1/8" PTF Straight Type "Alemite" #1961 (Monel).
54B	Grease Pressure Relief Fitting "Alemite #47200 5 PSI Maximum Overall Length 7/16" Straight Type with 1/8" Pipe Thread

**Running Gear
Customer Replaceable Items**

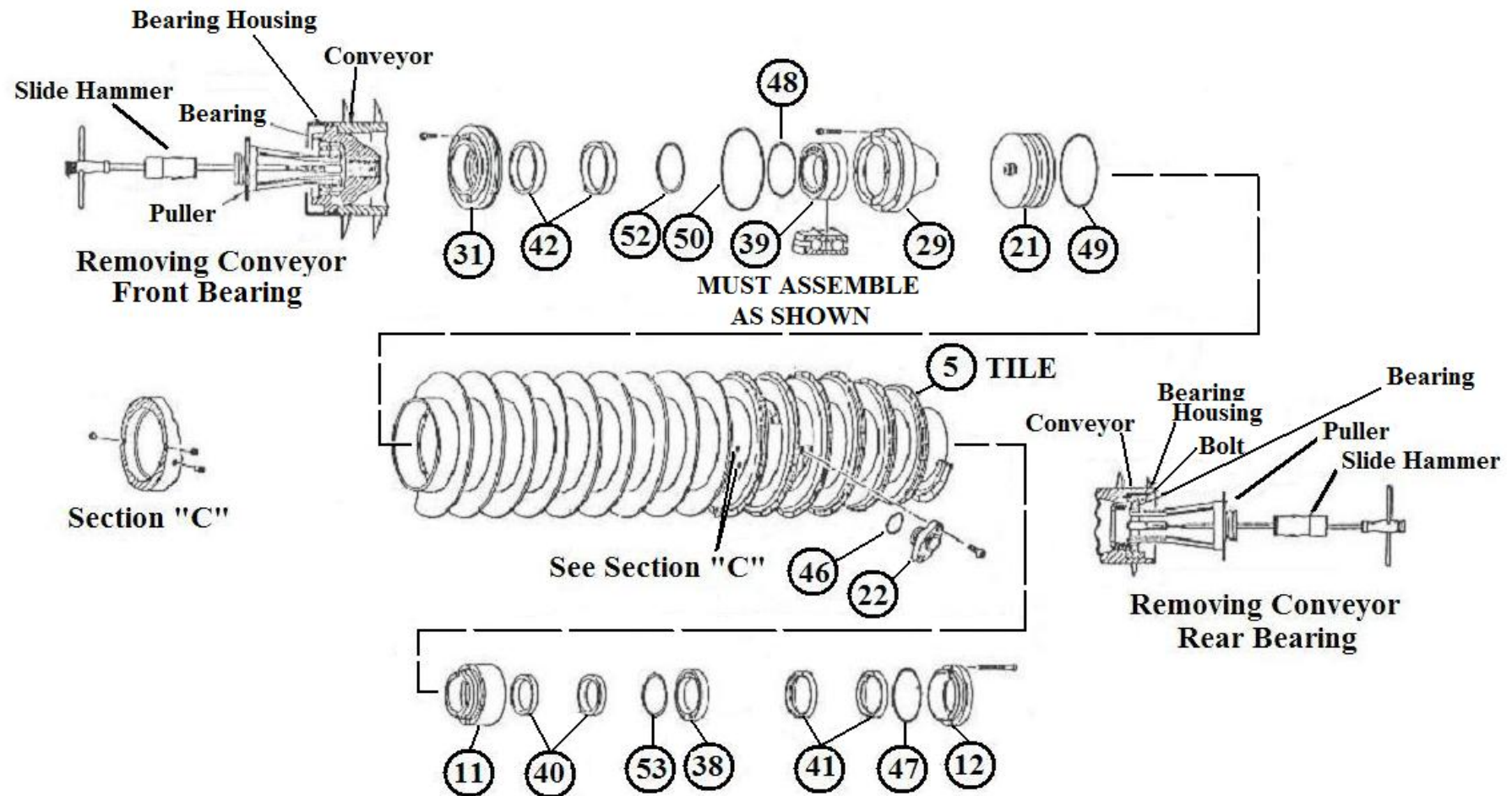
Item No.	Description	HH Part No.	Quantity
55	Electric Motor 50 H.P. 1750 RPM, 230/460 V AC 60 Hz. 3-Phase (Customer to specify type of motor required. Explosion proof, TEFC, etc.	3085	1
56	Adjustable Nema Motor Base	3084	1
57	Fluid Coupling "DANA FORMSPRAG" Model 12.4 HSD For Motor Output Shaft: 2.125" O.D.	*	1
58	Drive Belt	3101	1
59	Planetary Gear Reducer (Special Order) Contact HH	*	1
60	Drive Group Guard Enclosure Assembly (HH Fabricated Item)	3090	1
61	Gearbox Shroud Assembly (HH fabricated item)	3093	1
62	Over-Torque Shutdown Micro switch	313	1
63	Vibration Switch "Metrix" Instrument CD. Model 5078-20 115 VAC, CL.1 Group D, CL.2 Groups E,F, G. Explosion Proof Cast Aluminum Body Vibration Range: 0-5 G's Frequency Range: 0-200 Hz. Temperature Range: -40 Deg. C to + 120 Deg C	3094	1
64	Motor Starter Enclosure, Complete	3062	1
65	Motor Starter Box Support Stand	3113	1

* No Part Number assigned, order by description.

**Torque Limit Device
Parts List**

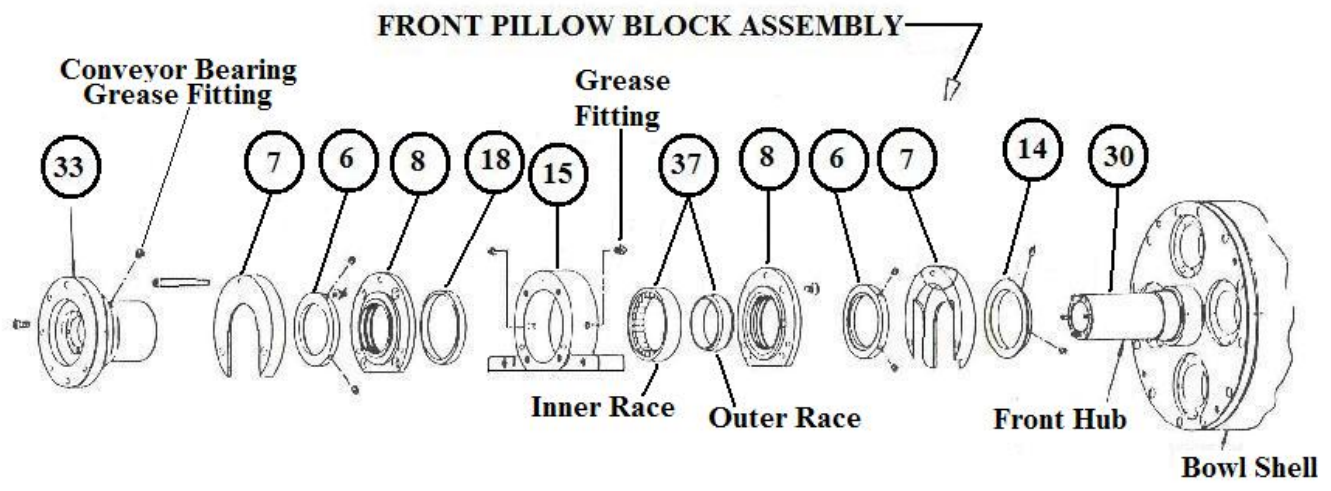
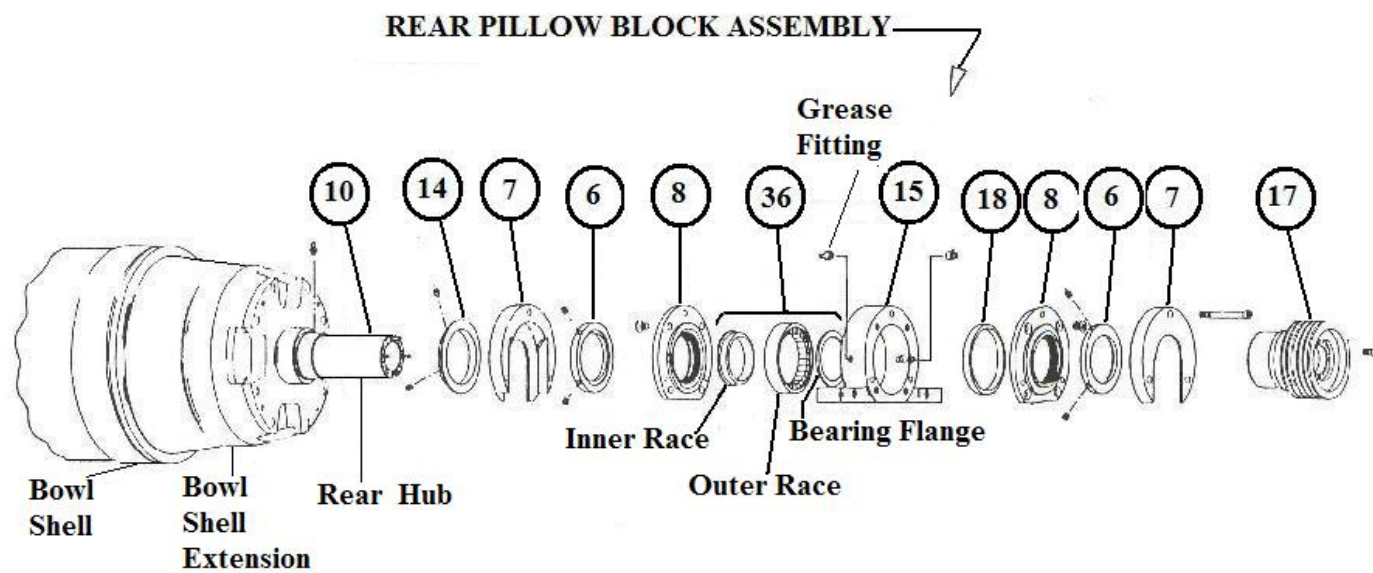
Item No.	Description	HH Part No.	Quantity
66	Torque Arm, Aluminum	03133	1
67	Setscrew, Steel		1
68	Pivot Arm Assembly. (Torque Lever)		1
69	Rub Pad Assembly (Custom Part	03175	1
71	Grease Fitting		1
72	Spring Loaded Compression Link Assembly. Consisting of the following:	03179	1
73	Spring Compression Link Stainless Steel		1
74	Torque Control Adjust. Nut, Brass		1
76	Spring Housing, Brass		1
77	Clevis Pin Stainless Steel		1
78	Flat Washer, Stainless Steel		2
79	Cotton Pin, Zinc Pl. Steel		2
80	Spring, Compression, Stainless Steel	03176	1
82A	Mounting Block (Complete Assembly)	03132	1
82	Mounting Block, C.S. 1 Required	03131	1
82B	Torque Lever Only	03180	1
83	Dowel, Torque Lever Pivot, S.S.	03125	1
84	Flat washer, Stainless Steel		1
85	Retaining ring, E-Type		1
86	Dowel, Stop Stainless Steel	03128	2
87	Dowel, Cylinder Pivot, Stainless Steel	03126	1
88	Flat washer, Brass		3
89	Cotter Pin, Zinc PL. Steel		1
91	Capscrew, Soc. HD. Gr. 8 Steel		4
92	Capscrew, Soc. HD. Gr. 8 Steel		4
93	Mounting Bracket (Micro switch) Stainless Steel		1
94	Capscrew, Soc. HD. Gr. 8 Steel		4
95	Machine Screw, Pan HD. Slotted Stainless Steel		2

1448 CONVEYOR ASSEMBLY



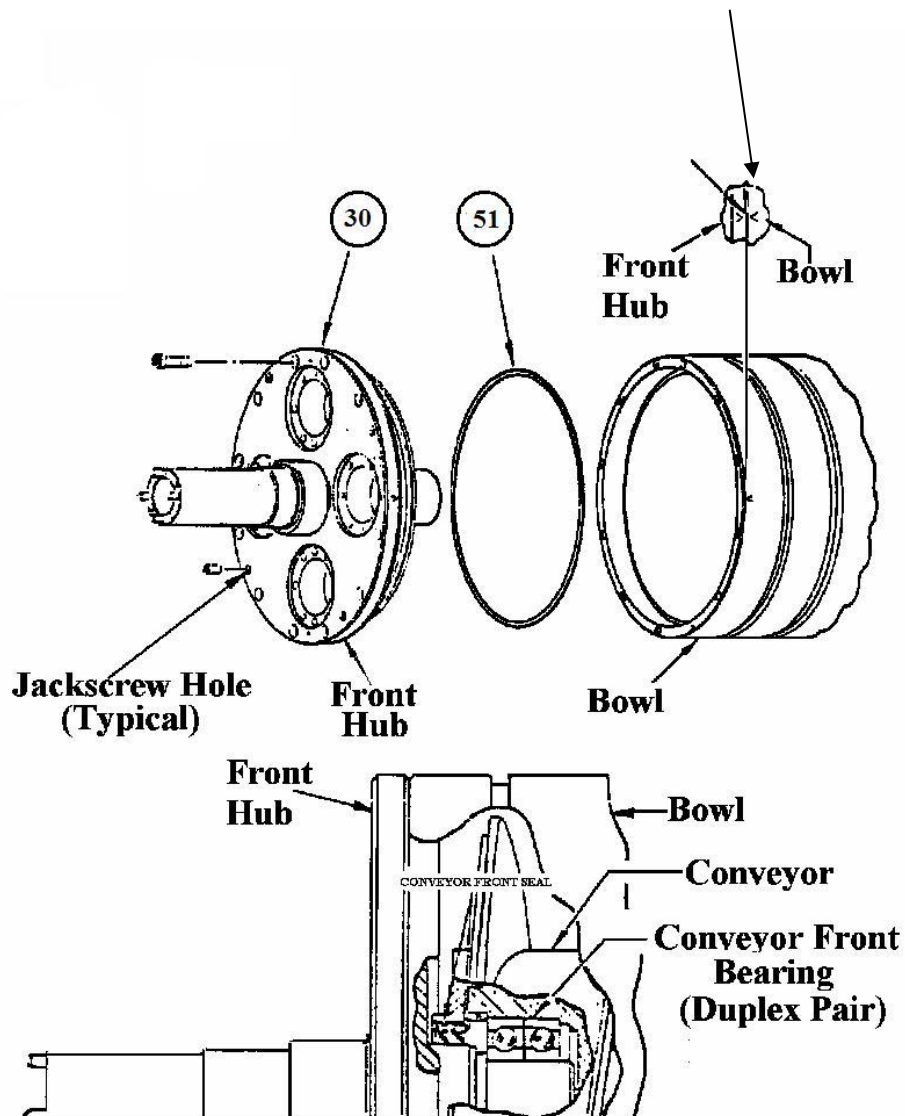
PILLOW BLOCK DISASSEMBLY

1. Stamp the top of the pillow block assemblies with an “S” for solid and an “L” for liquid, also stamp the top with a “V” with the point directed toward the bowl assembly. Be sure to stamp the horseshoe covers and pillow block covers on both sides of the pillow also.
2. Remove the six (6) bolts that retain the two (2) horseshoe covers and remove the horseshoe covers.
3. Remove eight (8) bolts from the sheave and using jack bolts remove the sheave from the bowl hub.
4. For liquid hub, remove the gear flange.
5. Using a two (2) or three (3) jaw puller, remove the pillow block as an assembly. Put a plate across the top of the hub for the stud to push on.
6. Remove the two pillow block covers and remove the bearing from the housing.
7. Loosen the two (2) setscrews in the pillow block flingers and the case flingers and remove both from the hub.
8. Clean all parts thoroughly and assembly in reverse order.

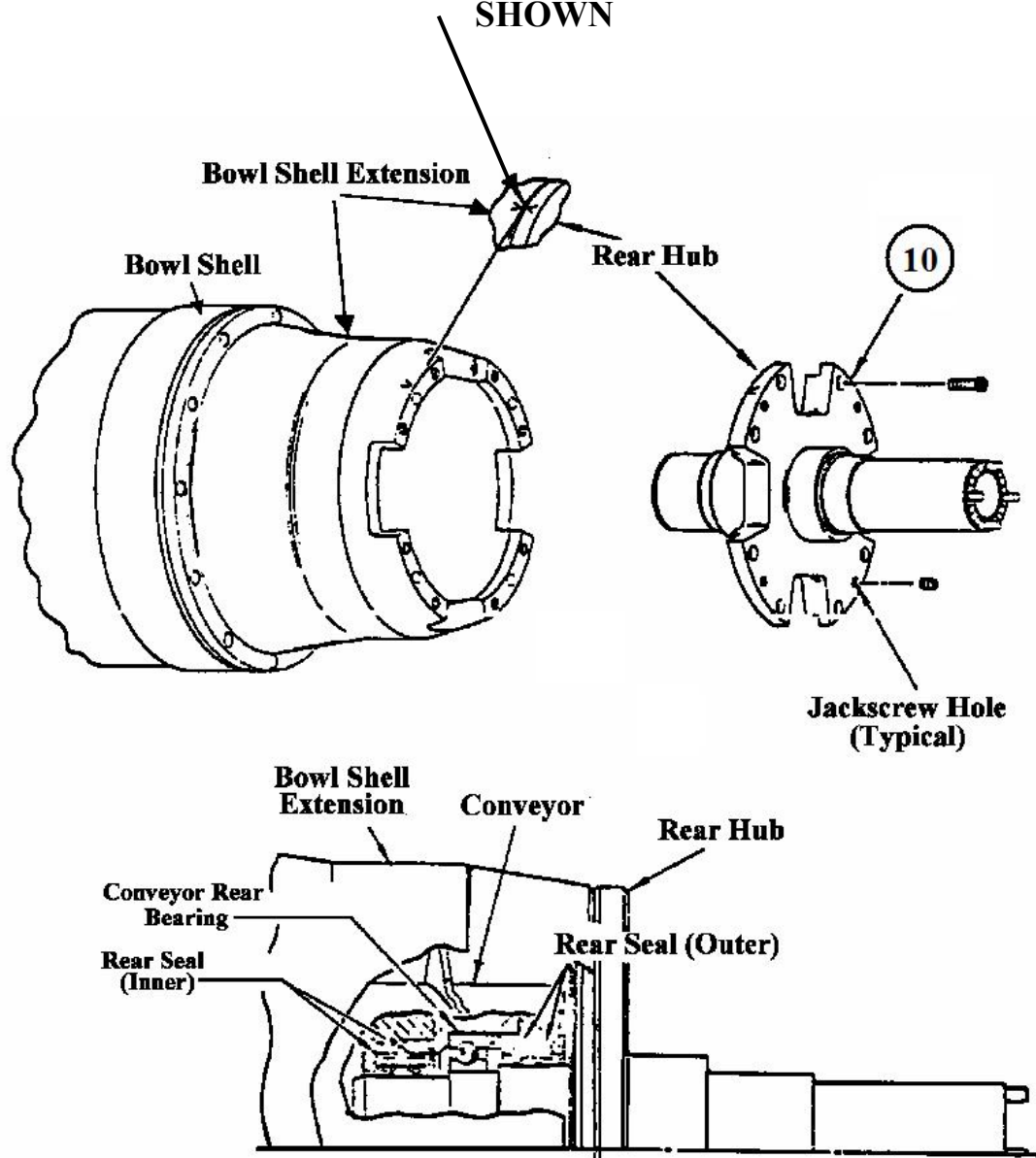


BOWL FRONT HUB ASSEMBLY

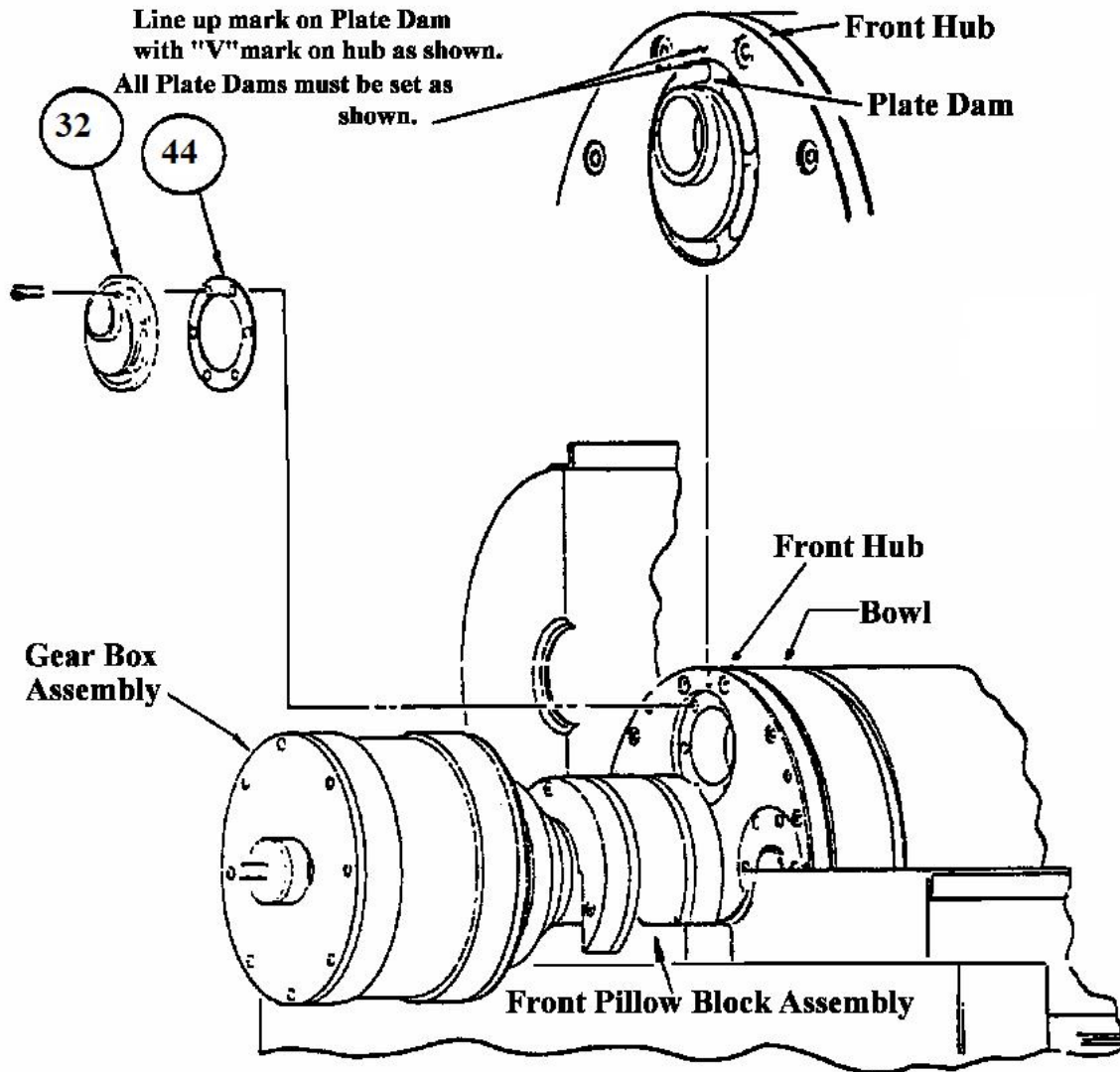
FRONT HUB AND BOWL SHELL ARE BALANCED AND STAMPED WITH BOWL ASSEMBLY: THEREFORE, THEY MUST BE REASSEMBLED WITH “V” MARKS IN LINE AS SHOWN



**REAR HUB AND BOWL SHELL EXTENSION ARE BALANCED
AND STAMPED WITH BOWL ASSEMBLY: THEREFORE, THEY
MUST BE REASSEMBLED WITH “V” MARKS IN LINE AS
SHOWN**



BOWL REAR HUB ASSEMBLY PLATE DAM ASSEMBLY



Maintenance Cautions Model 1448 Centrifuge

BEARINGS:

The inner and outer race must be replaced as a set.

Opened bearings, or cleaned parts should be kept covered until assembly.

Always use a thermometer to check the temperature of oil used to heat the bearings.

If no heat is used to install the bearings, use only an arbor press to insert bearings in place.

Correctly lubricate all bearings before operating the centrifuge.

Do not wash new bearings with solvent before installing.

Keep new bearing wrapped and boxed until ready for use.

SEALS:

Avoid touching the sealing surface. Keep seals wrapped in soft tissue until ready for installation.

THREADED CONNECTIONS:

All threaded connections and pilot diameters should be wiped clean and lubricated with an anti-galling compound such as “Never Seez.”

Torque all screws on the rotating assembly per the “recommended Capscrew seating torque” charts shown in the Start Up Section of this Manual. To help prevent Capscrew failure: If excessive torque is required to seat mating parts during assembly, the over-torqued screws should be removed, discarded, and replaced with new screws installed at the correct torque.

O-RINGS:

Inspect for nicks and cuts before installing. If damaged, do not install. Lubricate O-rings for easier installation.

MACHINED PARTS:

Clean with degreased solvent before reassembly.

Set parts on clean work area and protect finished surfaces and openings on the part.

Be sure to align any balanced parts on the rotating assembly by matching the V-marks stamped on the parts.

If more than one centrifuge is owned, do not interchange any parts which compromise a balanced rotating assembly.

Some Assembly and Disassembly Tips

1. Read the Service Manual
2. Keep all mating surfaces free from dirt and handle carefully to avoid nicks and burrs to the mating surfaces.
3. Check the inside of the conveyor for solids build-up
Not cleaning solids build-up can be the cause of vibration problems.
4. Lubricate O-Rings and fasteners when reassembling centrifuge components.
Anti-seize compound should be used on stainless steel fasteners because of their tendency to gall when used with mating stainless steel parts.
5. Follow the recommended torque values shown in the torque chart in the Service Manual.
6. Conveyors equipped with carbide tiles should never be set down directly on a concrete floor.
The carbide is very brittle and tile damage could result.
7. Monitor items such as drive belts, O-Rings, seals, and vibration isolators.
These items will become brittle with age and deterioration will adversely affect centrifuge performance.
Replace these items when indicated by inspection.

1448 STD BOLT LIST							
ITEM #	POSITION	QTY	ALLOY	TYPE	STYLE	SIZE	LOCK TIGHT OR NEVER SEIZE
CONVEYOR							
1	ACCELERATOR PLATE	2	SS	SET/POINT	SOCKET HEAD	3/8 x 1"	LOCKTIGHT 242
2	FEED NOZZLES	8	SS		SOCKET HEAD	1/2" X 1"	LOCKTIGHT 242
3	SPLINE ADAPTER TO BRG. HSG.	8	BLACK		SOCKET HEAD	3/8 X 3/4"	LOCKTIGHT 242
4	SPLINE ADAPTER	2		DOWEL PIN		3/8 X 1"	
5	LIQ BRG HOUSING	8	BLACK		SOCKET HEAD	3/8" X 1 3/4"	NEVER SEIZE
6	LIQ BRG HSG SEAL COVER	4	SS		SOCKET HEAD	3/8 X 1 1/4"	NEVER SEISE
7	SOLID END BRG HSG	6	SS		SOCKET HEAD	5/16" X 3"	NEVER SEIZE
8	SOLID END BRG HSG SEAL COVER	(HELD BY ABOVE)					
BOWL							
1	BOWL EXTENTION	12	SS		SOCKET HEAD	3/8" X 1 1/4"	LOCKTIGHT 242
2	SOLID END HEAD	8	SS		SOCKET HEAD	3/8"X 1"	LOCKTIGHT 242
4	LIQ END HEAD	12	SS		SOCKET HEAD	3/8" X 1 1/4"	LOCKTIGHT 242
5	DAM PLATES	24	SS		SOCKET HEAD	5/16" X 3/4"	NEVER SEIZE
6	DISCHARGE INSERTS	32	SS		SOCKET HEAD	5/16" X 5/8"	LOCK TIGHT 242
7	PLOWS	8	SS		SOCKET HEAD	3/8 X 3/4"	LOCK TIGHT 242

PILLOW BLOCK BEARINGS (BOTH LIQ AND SOLIDS END ARE TYPICAL)							
ITEM #	POSITION	QTY	ALLOY	TYPE	STYLE	SIZE	LOCK TIGHT OR NEVER SEIZE
1	PILLOW BLOCK TO BASE	4	BLACK		HEX HEAD	5/8 X 2 1/4" LOCK WSHR	NEVER SEIZE
2	END COVER	4	BLACK		FLAT SOC. HD	3/8" X 3/4"	NEVER SEIZE
3	HORSE SHOE COVER	3	SS		SOCKET HEAD	5/16 X 3 1/2"	NEVER SEIZE
4	CASE FLINGER	2	SS		SET/CUP	10-24 X 1/4"	NEVER SEIZE
5	GREASE FLINGER	2	SS		SET/CUP	10-32 X 3/8"	NEVER SEIZE
6	GREASE ZERT	6	PLATED		HEX	1/8" NPT	N/A
GEAR END							
1	GEAR FLANGE	6	BLACK		SOCKET HEAD	5/16 X 1"	NEVER SEIZE
2	GEAR BOX	6	BLACK		SOCKET HEAD	5/16 X 1"	NEVER SEIZE
SHEAVE							
1	SHEAVE		BLACK		SOCKET HEAD	1/4" X 1"	NEVER SEIZE
SUB BASE TO SHOCK MOUNT							
1	SHOCK MOUNT TO SKID	12	SS		SOCKET HEAD	1/2" X 1 1/4" FLAT AND LOCK WSHR	NEVER SEIZE
SUB BASE TO SHOCK MOUNT							
1	BOLT THROUGH SUB BASE	6	SS		HEX HEAD	1/2" X 3 1/2" FLAT AND LOCK WSHR	NEVER SEIZE
2	NUTS UNDER SHOCK MOUNT	6	SS		HEX HEAD	1/2"	NEVER SEIZE
BASE TO SUB BASE							
1	BOLTS THROUGH BASE	4	SS		HEX HEAD	1/2" X 4 1/2" FLAT AND LOCK WSHR	NEVER SEIZE
2	FEED TUBE ARM TO BASE	4	BLACK		SOCKET HEAD	3/8 X 1 1/4" LOCK WSHR	NEVER SEIZE
3	FEED TUBE ARM CAP	4	BLACK		SOCKET HEAD	3/8 X 1 3/4"	NEVER SEIZE
4	EYE BOLT HOLES	4	SS		HEX HEAD	3/4 X 1" FLAT AND LOCK WSHR	NEVER SEIZE

CASE TO BASE							
ITEM #	POSITION	QTY	ALLOY	TYPE	STYLE	SIZE	LOCK TIGHT OR NEVER SEIZE
1	BOLTS THROUGH CASE TO BASE	12	SS		HEX HEAD	1/2 X 1 1/2" FLAT AND LOCK WSHR	NEVER SEIZE
2	TEFLON IN CASE	6	SS		HEX HEAD	5/16 X 1" FLAT AND LOCK WSHR	NEVER SEIZE
3	COVER SAFETY PIN	1	PLATED		HITCH PIN	5/8 X 2"	
GEAR GUARD							
1	BOLTS THROUGH GUARD	4	SS		HEX HEAD	3/8" X 1" FLAT AND LOCK WSHR	NEVER SEIZE
BELT GUARD							
1	BOLTS THROUGH GAURD TO SUB BASE	6	SS		HEX HEAD	3/8" X 1" FLAT AND LOCK WSHR	NEVER SEIZE
TORQUE BLOCK							
1	TORQUE BLOCK TO BASE	4	BLACK		SOCKET HEAD	3/8 X 1 3/4"	NEVER SEIZE
MOTOR TO SUBBASE							
1	SLIDE BASE TO SUBBASE	4	SS		HEX HEAD	5/8 X 2" FLAT AND LOCK WSHR	NEVER SEIZE

RECOMMENDED CAPSCREW SEATING TORQUE

Follow recommended seating torques when assembling all socket head cap screws.

Nominal Size	Recommended Seating Torque Coarse Thread (Lubricated)*	
1 / 4	75 in lbs	6.25 ft. lbs.
5/16	135 lbs.	11.25 ft. lbs
3/ 8	240 in lbs	20 ft. lbs.
1/ 2	600 in lbs	50 ft. lbs

CHART I (STAINLESS STEEL)

Nominal Size	Recommended Seating Torque			
	Coarse Thread Dry		Coarse Thread Lubricated*	
	Plain	Plated	Plain	Plated
1 / 4	150/13	112/9	120/10	90/7.5
5/16	305/25	230/19	245/20.4	185/15.4
3/ 8	545/45	410/34	435/36	330/27.5
1/ 2	1300/108	970/81	1040/87	775/65
3/ 4		3300/275	3520/293	2640/220

CHART 2 (ALLOY STEEL) IN. LBS./FT. LBS

Lubricate with “Never-Seez” or equivalent

FLIGHTING TILE CAUTION

CAUTION:

The flighting tiles used on the 1448 conveyor may be the spray-on hard face type or the sintered tungsten carbide backing tile type.

The Backing tile type is comprised of a stainless steel backing plate, a sintered tungsten carbide tile, and a copper/silver solder “sandwich” between the two.

Even though the rotating assembly is comprised of 316 Stainless Steel, the copper will not withstand attack by highly corrosive chemicals such as sulfuric and nitric acids.

If the copper/silver solder tile bond is attacked by corrosive chemicals, the result will be tiles coming loose during centrifuge operation.

To avoid this potentially costly problem, always check any chemicals for compatibility with copper/silver solder before attempting to introduce them into the centrifuge.



SECTION 6

PLANETARY GEARBOX AND BACKDRIVE ASSEMBLY

Hutchison Hayes, L.P.
Model P - 52 / P - 125 Planetary Gearbox
Instruction Manual

CONTENTS

1. Construction
2. Installation
3. Operation
4. Lubrication
5. Maintenance
6. Dismantling
7. Assembly

Table 1 Recommended Oil Products

1. Construction

- (1) The reduction gear unit is a two (2) stage planetary system. The first stage uses two (2) planetary gears and the second stage uses three (3) planets.
- (2) All bearings are ball type.
- (3) Lip style oil seals are used at the gearbox cover plates where the output and first stage pinion shafts pass through.
O-Rings are used to seal mating parts which are static with respect to each other.
- (4) Threaded plug openings are provided for oil fill, overflow, and drain.

2. Installation

- (1) The gearbox is designed to operate in the horizontal plane, that is, axially in line with the model 1448 Centrifuge rotating assembly.
- (2) The gearbox is driven by means of a gear flange which attaches at the centrifuge end to the liquids end bowl hub assembly. The gearbox bolts directly to the other end of the gear flange.
- (3) The gear flange must be accurately aligned within .002 inches run out, and secured correctly to the bowl hub before the gearbox is mounted.
- (4) After mounting the gearbox check run out on the first stage side. If run out exceeds .005 inches, shims may be required.

3. Operation

- (1) Before running the gearbox, be sure that the unit is filled to the proper level with lubricating oil.
- (2) For recommended lubricating product, see Table 1 below.
- (3) With the fill opening at top dead center, remove the plug from the fill connection and the uppermost level connection which is located on the cover plate furthest away from the centrifuge.
Pour oil into the fill port located on top of the casing until it starts to overflow from the side port.
Plug tightly after filling. Use Teflon tape. The required oil quantity is approximately one (1) gallon.
- (4) On initial operation, check the direction of rotation of the gearbox. It should be counter-clockwise as you stand at the gearbox end facing the centrifuge.

- (5) If excessive temperature on the casing (above 180 deg. F.) occurs, stop the centrifuge and check for the cause.
- (6) If excessive noise and/or vibration occurs suddenly, stop the centrifuge and check for the cause.

4. Lubrication

- (1) Gears are lubricated by oil bath.
- (2) Refer to Table 1 below for recommended lubricating product.
- (3) Never add a different brand of lubricating oil to the existing supply. Mixing oil must be strictly avoided.
- (4) When changing brands, flush gear unit thoroughly before filling.

5. Maintenance.

- (1) Oil Change Intervals
First change after 500 hours of operation, then every six (6) months or 2500 operating hours whichever comes first.
- (2) Any unusually severe operating conditions such as rapid ambient temperature fluctuations, or the presence of corrosive gases in the operating area could affect the life and characteristics of the lubricating product. Contact the manufacturing company for recommendations to follow.
- (3) For extended storage of the P -52 (30 days or longer) fill the unit with a corrosion preventive oil and run for a short period after flushing.
- (4) Restarting the Unit:
Empty and flush the gearbox. Refill with the correct type and quantity of oil.
- (5) Wipe off any spilled oil. Run the unit briefly and check for leaks.

6. Dismantling

We recommend that the gearbox not be dismantled because special handling procedures are required for maintenance of these units. A clean room environment and a thorough knowledge of clearances and fits is required. With the exception of replacement of the first stage pinion bearing and seal, the gearbox should be returned to its manufacturer for inspection and damage and/or wear assessment.

An incorrectly reassembled planetary gearbox could cause major damage to the unit, the centrifuge, and could pose a potentially lethal danger to operating personnel.

7. Assembly

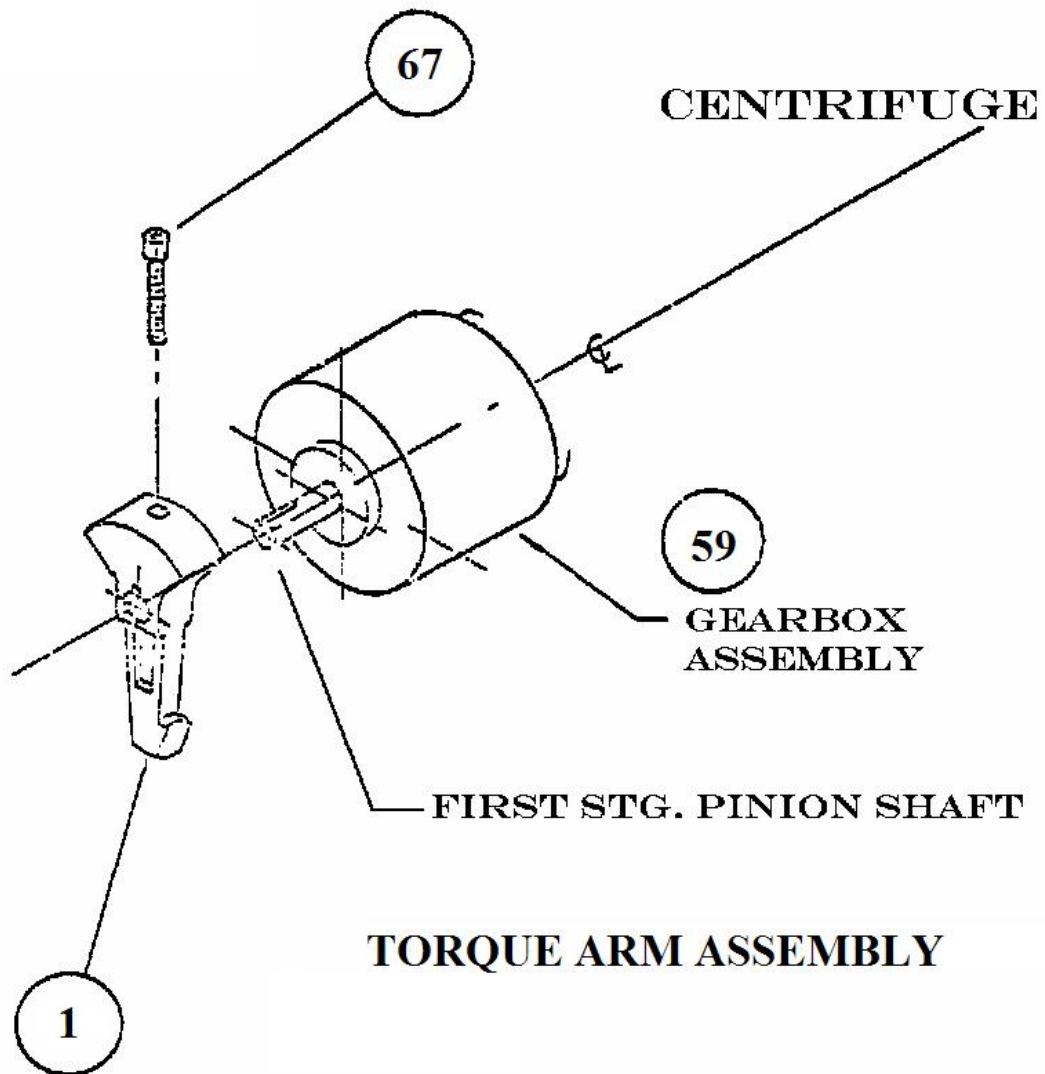
- (1) Use care to prevent any foreign debris from entering the gearbox.
- (2) Secure capscrews using proper torque.
- (3) Change O-Ring whenever the gearbox is opened up.

TABLE 1

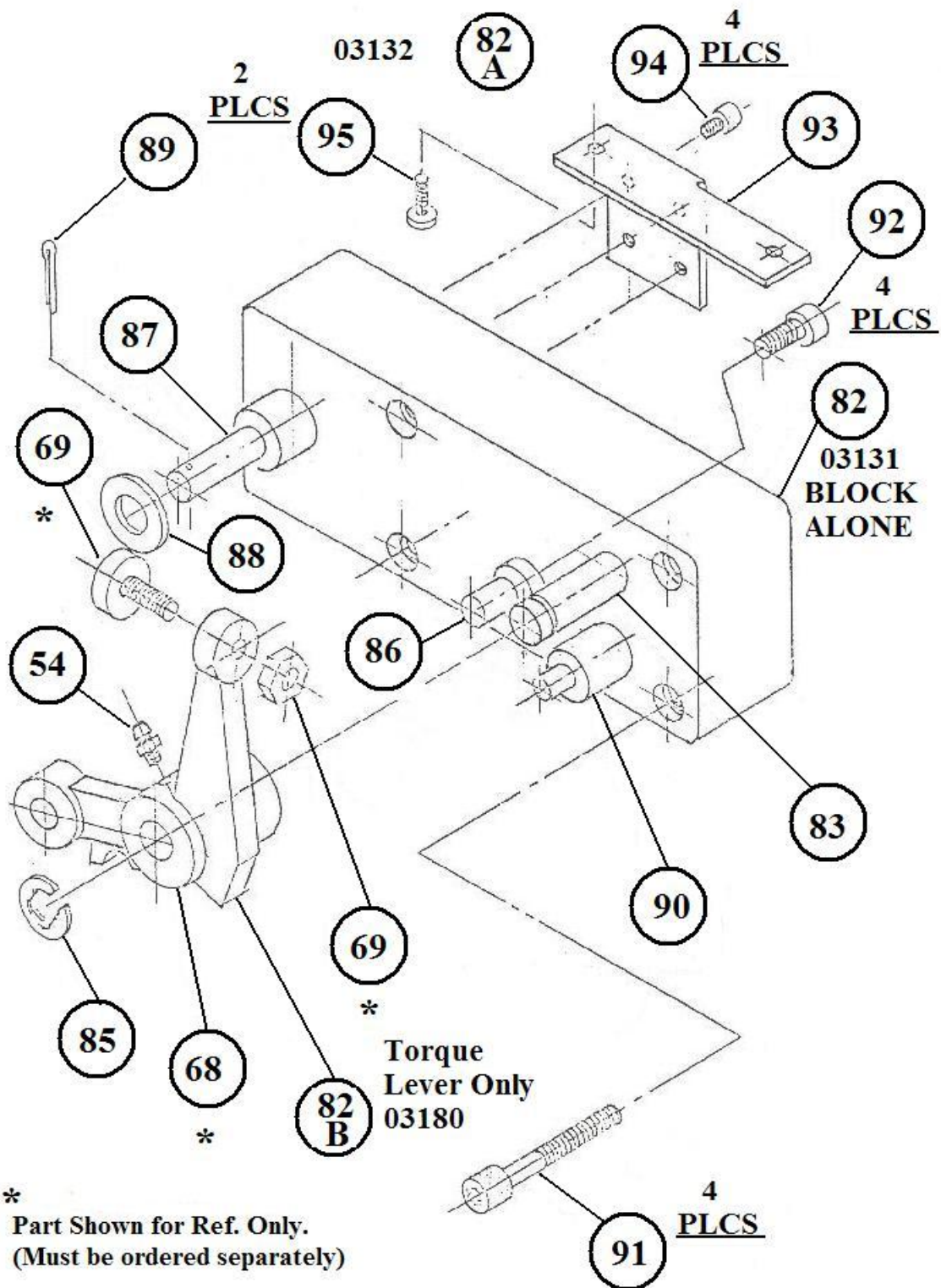
RECOMMENDED OIL PRODUCT

**ROYAL PURPLE “SYNERGY” GEAR OIL ISO GRADE 150
SAE 90
AGMA GR. 4EP**

TORQUE ARM ASSEMBLY



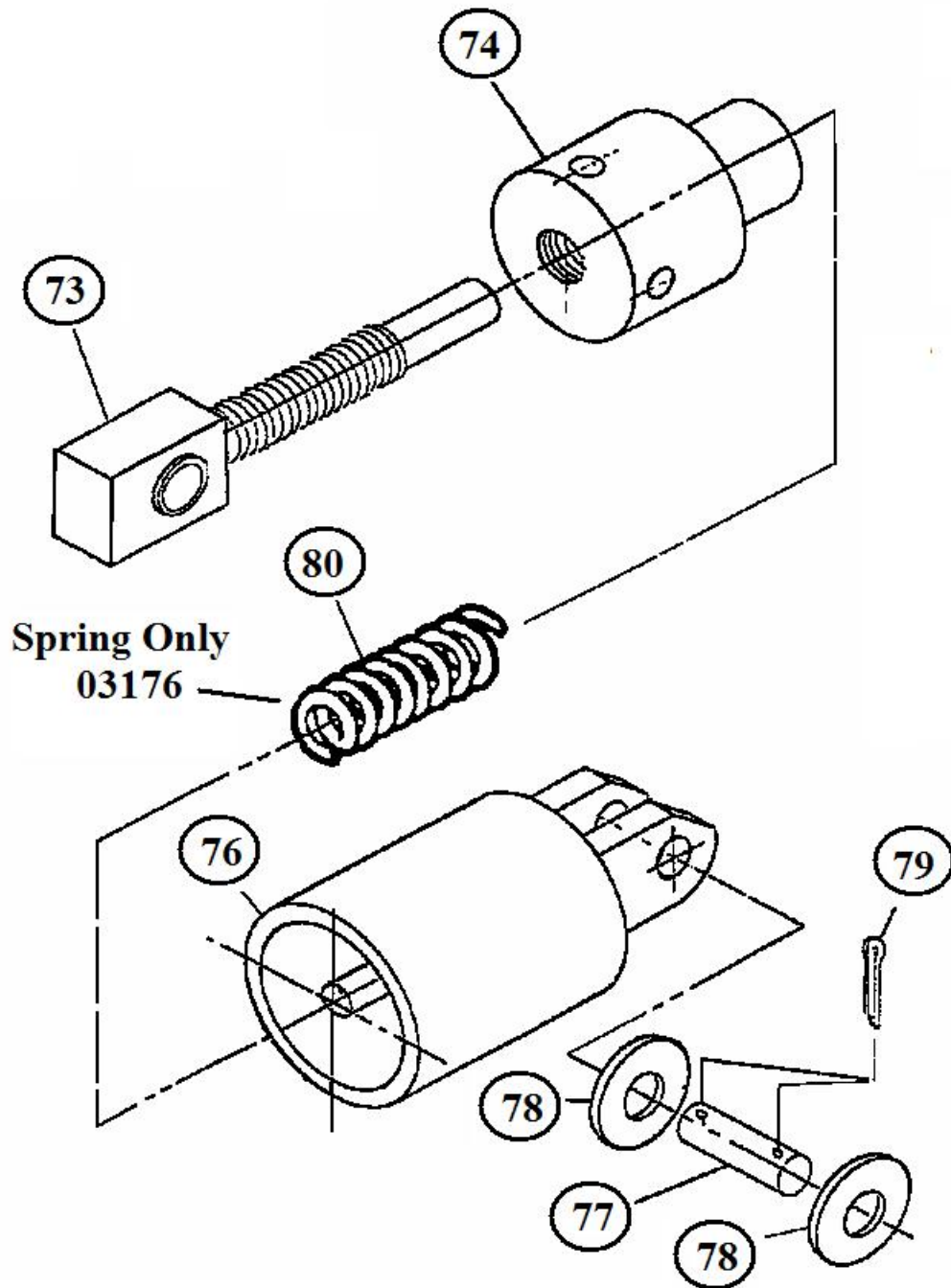
MOUNTING BLOCK ASSEMBLY



1430 / 1448 TORQUE CONTROL MECHANISM

**Compression Link Assembly
Complete with Spring 03179**

**Compression Link Assembly
Mechanism Only (73,74,76) 03134**





SECTION 7

PARTS LIST

PARTS LIST

To order parts contact:

Hutchison Hayes, L. P.
P. O. Box 2965
Houston, Texas 77252

3520 East Belt
Houston, Texas 77015
Tel: (713) 455-9600
(800) 441 4850
Fax: (713) 455 7753
Web site: www.hutch-hayes.com
Email: ewarren@hutch-hayes.com

The parts listed in this section are customer replaceable components, except for the machined items, which should be ordered from HH.

CENTRIFUGE CONTROL PANEL PARTS LIST

STANDARD PANEL SQ. D		
Qty	Hutch PN	Description
1	4651	CONTACTOR MAIN DRIVE
2	4729	PUSH BUTTON KILLARK GO2-GR12D-N34
1	4829	CONTACTOR FEED PUMP
1	4830	OVERLOAD FEED PUMP
1	4831	OVERLOAD MAIN DRIVE
1	4832	AUX MAIN DRIVE
1	4833	MAN STARTER FEED PUMP
1	4834	TRNS
1	4835	BREAKER MAIN DRIVE
1	4836	ENCLOSURE KILLARK
1	4837	HANDLE DISCONNECT

1448 Oilfield Skid Parts List

Qty	HH Part No.	Description
15	2654	MAIN DRIVE MOTOR WIRE
12	3044	HINGE PIN FOR 5500 CASE HINGE
12	3044P	COTTER PIN FOR HINGE PIN
12	3047	CLAMPING SHOE FOR 1655 CASE HINGE(7005)
12	3048	EYEBOLT FOR 1655 CASE HINGE
12	3049	NUT FOR 1655 HINGE BOLT
1	3052	1448 LIQUID END DISC. TRANSITION
1	3053	1448 SOLID END DISC. TRANSITION
1	3082	STARTER, 60HP - 10 TO 20 HP FVNR DUPLEX
1	3084	SLIDE BASE MOTOR MT, 50HP 2-BOLT 1448
1	3085	MOTOR EXPRF, 50HP, 1800RPM, 230/460V
1	3089	GREASE FITTING
1	3090	BELT GUARD ASSY, 1448
1	3093	GEARBOX GUARD ASSY, 1448
1	3094	VIBRATION SWITCH, EXPRF ASSY
1	3103	FLUID CLUTCH, FORMSPRAG 2-1/8"
1	3104	SUB BASE ASSY, 1448
1	3106	BASE ASSY COMP 1448 W/FeedTube Supt Arm
1	3109	OILFIELD SKID, 1448
1	3113	STARTER RACK, 1448 & 1655
1	3114	CASE/COVER ASSEMBLY, 1448
1	3125	TORQ LEVER PIVOT PIN, 1448 TRQ MT BLK(1)
1	3126	CYLINDER PIVOT PIN, 1448 TRQ MT BLK (1)
2	3128	STOP PIN, 1448 TRQ MT BLCK (2)
1	3130	MICRO SWITCH, TORQUE LIMIT 1448 & 5500
1	3131	TORQUE MTG BLOCK ONLY 1448 (NO PINS)
1	3134	TORQUE SPRING MECH ONLY LESS SPRING 1448
2	3135	SEAL (INSIDE SLD END COVER) 1448
2	3136	SEAL (LQD END SEAL PLATE) 1448
2	3137	SEAL (LQD END SEAL PLATE) 1448
1	3146	V-BELT, 85", 1448
4	3148	DOWEL PINS

1448 Oilfield Skid Parts List (Continued)		
Qty	HH Part No.	Description
4	3149	GASKET, 1448 DAM PLATE
1	3150	BOWL ASSY W/ LINER, 1448
1	3151	BOWL EXTENSION, 1448
1	3152	BOWL HUB, 1448 LIQUID (HEAD)
1	3153	BOWL HUB, 1448 SOLID (HEAD)
1	3154	USE 3023 CONVEYOR
1	3155	1448 FEED TUBE HVY DUTY MATL 1-1/2 S/160
2	3156	CASE FLINGER, 1448
1	3157	HOUSING, 1448 SOLIDS END SEAL
1	3158	HOUSING, 1448 LIQUID END SEAL
1	3159	ACCELERATOR PLATE 1448
1	3160	SEAL PLATE (HSE) PULLEY SHEAVE, 1448
1	3162	SHEAVE, FORMSPRAG 3250 RPM, 1448 (10.6")
2	3163	PILLOW BLOCK SPACER RING 1448
4	3164	ISOLATOR 1448 (STARTOR RACK)
4	3166	PILLOW BLOCK FLINGER, 1448
2	3167	FLINGER COVER, 1448 INNER PB
1	3168	BEARING (P.B. LQD END) FRNT, 1448
1	3169	BEARING (P.B. SLD END) REAR, 1448
1	3170	BEARING (CNVR SLD END), 1448
4	3172	FEED NOZZLE W/3406 CARBIDE INSERT, 1448
1	3173	WEAR INSERTS SET (4-LFT - 4-RT), 1448
1	3174	WIPER PLOW SET, (2 PER SET) 1448 (BOWL)
1	3175	TORQUE TRIP PAD, 1448/1655
1	3176	TORQUE SPRING, 1448
2	3177	FLINGER COVER, 1448 (OUTER PB)
6	3178	ISOLATOR, 1448 (BASE OR SUB BASE)
1	3180	USE 4094
2	3181	BEARING (CNVR LIQUID END), 1448
1	3182	SHEAVE, 1448 CONVR DRIVE
1	3183	GEAR FLANGE ADAPTER, 1448
1	3184	HOUSING, 1448 LQD END CONVR BRG

1448 Oilfield Skid Parts List (Continued)		
Qty	HH Part No.	Description
1	3185	HOUSING, 1448 SLD END CONVR BRG
1	3186	GEARBOX SPLINE ADAPTER, 1448
2	3187	PILLOW BLOCK, 1448
4	3188	PILLOW BLOCK COVER, 1448
4	3190	O-RING, 1448 (FEED NOZZLE)
1	3191	O-RING, 1448 (REAR SL HSG)
1	3192	O-RING, 1448 (FRONT SL HSG)
1	3193	O-RING, 1448 (ACCELERTER PLATE)
1	3194	O-RING, 1448 (FRNT SL HSE OUTER)
2	3195	O-RING, 1448 (BOWL EXT. & LQD HD)
1	3196	RETN RING, 1448 (REAR SL HSE)
1	3197	RETN RING, 1448 (FRNT SL HSE)
1	3200	P-52 GEARBOX (52:1 RATIO)
4	3476	DAM PLATE, 1448
1	3708	NAMEPLATE ROTATION RIGHT FOR CENTRIFUGES
1	3709	NAMEPLATE ROTATION LEFT FOR CENTRIFUGES
2	3710	NAMEPLATE WARNING 3 X 5 FOR CENTRIFUGES
1	4094	TORQUE LEVER 1655, 1448



SECTION 8

ELECTRICAL & WIRING

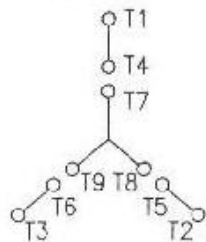
WIRING SPECS				
Wire size and length for 1448 Oil Field Centrifuge				
Main drive motor 50 HP	12'	6/4 with 16/4 gexol armored and sheathed	753-C-1 1/4"	753-C-1 1/4"
Vibration switch	6'	18/2 gexol armored and sheathed	753-O-1/2"	753-O-1/2"
Micro switch	6'	18/2 gexol armored and sheathed	753-O-1/2"	753-O-1/2"

HUTCHISON-HAYES INTERNATIONAL, INC.

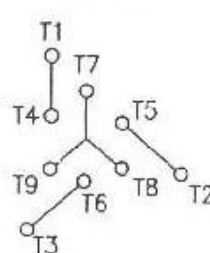
(713) 452-0222 FAX: (713) 457-6143 HOUSTON, TEXAS

WYE-CONNECTED MOTORS

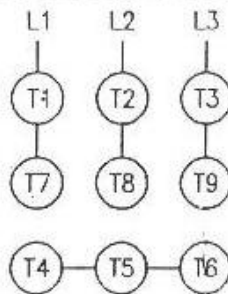
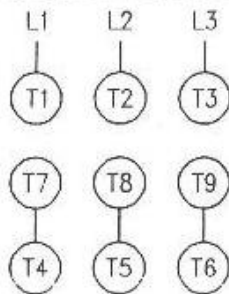
HIGH VOLTAGE SERIES



LOW VOLTAGE PARALLEL



TERMINAL CONNECTIONS



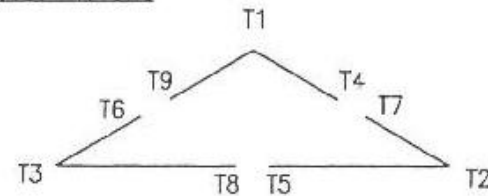
	L1	L2	L3	TOGETHER		
LOW VOLTAGE	T1	T2	T3	T4	T5	T6
HIGH VOLTAGE	T1	T2	T3	T4	T5	T6

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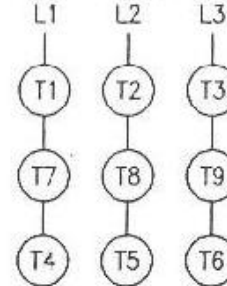
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NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	REVISIONS			REVISIONS	

DELTA-CONNECTED MOTORS

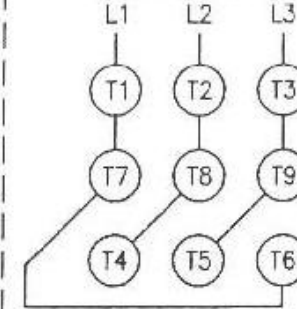
SHT. 1 OF 1



HIGH VOLTAGE SERIES



LOW VOLTAGE PARALLEL



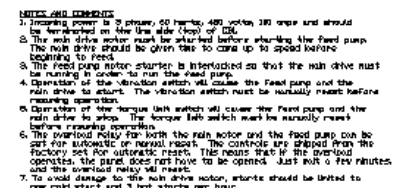
TERMINAL CONNECTIONS

	L1	L2	L3	TOGETHER		
LOW VOLTAGE	T1 T6 T7	T2 T4 T8	T3 T5 T9			
HIGH VOLTAGE	T1	T2	T3	T4	T5	T6

1448 HORIZONTAL CENTRIFUGE

VOLTAGE CONVERSION, 220/480

SCALE	NONE	DATE	
CHK.		DATE	
APR'D		DATE	
DRAW NO.: A-		1448-VC	REV. A

[illegible]

SCALE	TRAVEL	REV
1:1	144B-FILE	1



SECTION 9

TROUBLE SHOOTING

Centrifuge Trouble Shooting

(* Hydraulic Unit Only)

**BEFORE PERFORMING ANY REMEDIES FOLLOW THE PROPER
LOCK-OUT, TAG-OUT PROCEDURES**

Problem	Possible Cause	Remedy
Unit will not start	Vibration switch tripped	Reset switch
	No power	Check source
	Blown fuses	Replace & trace cause
	Drive starter	Repair or replace
	Drive failure	Repair or replace
	Overheated Drive	Cool, restart, trace problem
	Torque control switch tripped *Low Oil Level *High Oil Temperature *Pump Unit in Red Flag Condition	Reset, trace problem Fill to Correct Level Wait till Oil Cools Correct Possible Pack-Off in Centrifuge
Centrifuge shuts down	Blown fuse	Replace, trace cause
	Overload relays tripped	Reset
	Overheated drive motor	Cool, trace cause
	Vibration switch tripped	Reset, trace cause
	Torque control switch tripped	Reset, trace cause
	*Red Flag over-Torque condition	Correct Pack-Off in Centrifuge
	*High Oil Temperature	Wait till Oil cools
	*Low Oil Level	Fill to appropriate level

Centrifuge Trouble Shooting (Continued)

Problem	Possible Cause	Remedy
Excessive Vibration	Isolators improperly secured	Tighten
	Flexible piping not used at machine connections	Repipe
	Conveyor flights plugged with solids	Flush or clean as required
	Conveyor dead chamber filled with product	Remove feed tube & flush conveyor with high pressure
	Loose fasteners or components	Tighten
	Gearbox or Rotodiff misaligned	Shim, recheck run out
	Pillow block or conveyor bearings damaged	Install new bearings
	Bowl parts worn	Repair, replace, rebalance
	Conveyor flights worn	Repair, replace, rebalance
Concentrate not clear Solids not dry	Incorrect Pond Depth	Change setting
	Conveyor flights worn	Repair or replace
	*Wrong differential Speed	Change differential speed on pump unit
	Feed temperature too low	Readjust temperature
	Feed rate too high	Readjust
	Emulsification of liquids or degradation of solids	Pump speed is too high

(* Hydraulic Unit Only)



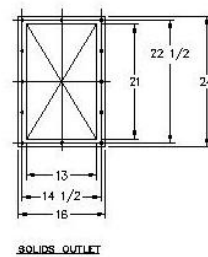
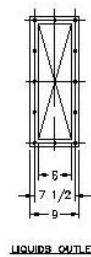
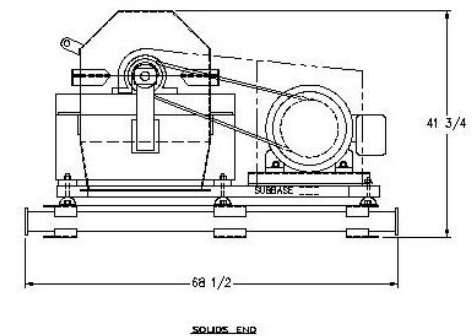
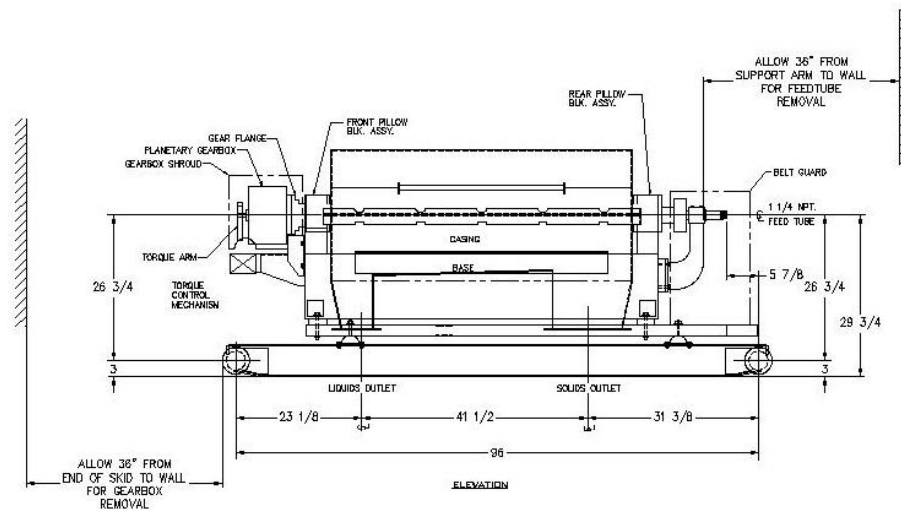
SECTION 10

ELEVATIONS, DIMENSIONS & WEIGHTS

COMPONENT WEIGHTS AND DIMENSIONS

1448 Components Description	Weight Lbs.
1448 Oil Field Unit	5,600
1448 HD Skid Unit	5,800
1448 HD Brake Smart skid unit	6,800
1448 Base Unit (no GB)	2,600
1448 Case and Cover	700
1448 Rotating Assembly (no g.b.)	1,200
1448 Bowl Assembly (no conv.)	1,700
1448 Conveyor	500
1448 Brake Smart Panel	1100
P-52,125 Gearbox	140

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FLOWAGE:
UNLESS NOTED OTHERWISE:
ALL DIMS ARE IN INCHES.

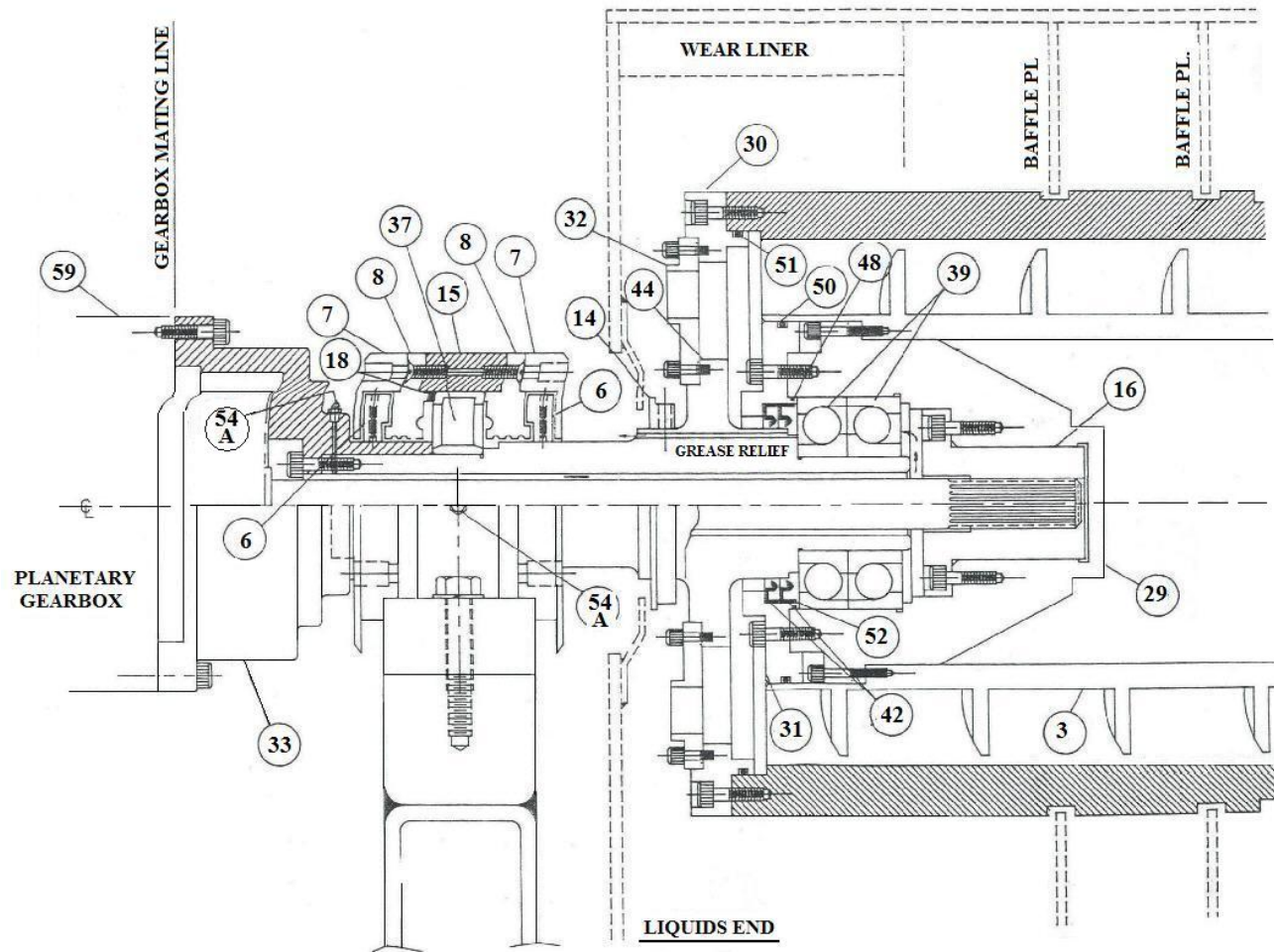
NTL:
TOLERANCE NOTES: MATERIAL SPECIFICATIONS & NOTES:

PART NUMBERS/REFERENCE DRAWINGS/DWG FILES		REVISIONS	
1	ADDED GEARBOX AND FEEDTUBE REMOVAL NOTES	WGL	12 20 04
0	ISSUED FOR REFERENCE	WGL	04 01 04
NO.	DESCRIPTION	BY	DATE

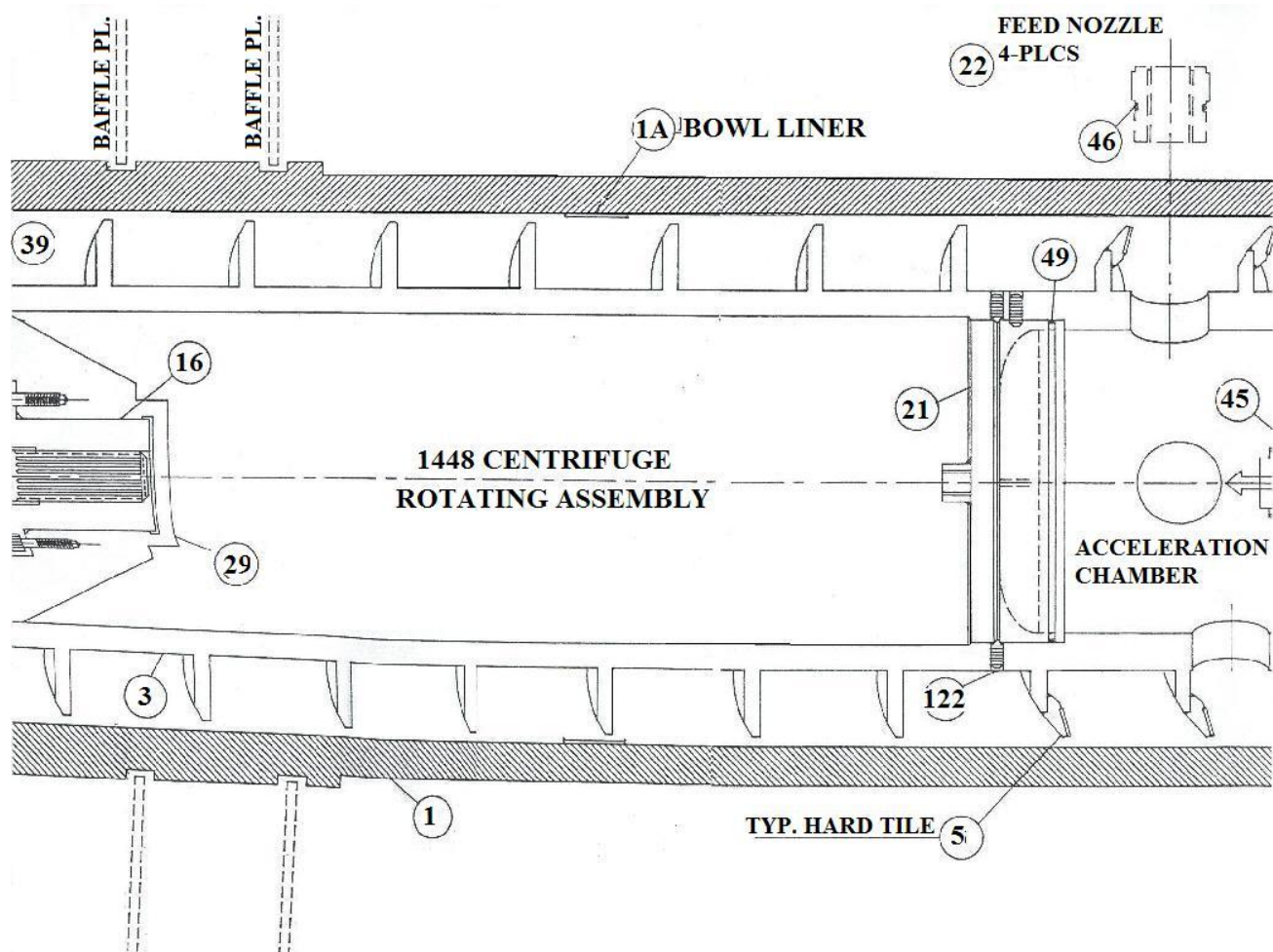
HUTCHISON-HAYES INTERNATIONAL, INC.
P.O. BOX 2665 HOUSTON, TEXAS 77015
TELEPHONE: 713-755-4000 FAX: 713-488-7703

STANDARD LAYOUT			
144B CENTRIFUGE			
DRAWN BY: W. CLINN	DATE: 04/05/04	CHECKED: APPROVAL:	JOB:
SCALE: FULL	DRAWING: D-144B STANDARD	REV: 1	

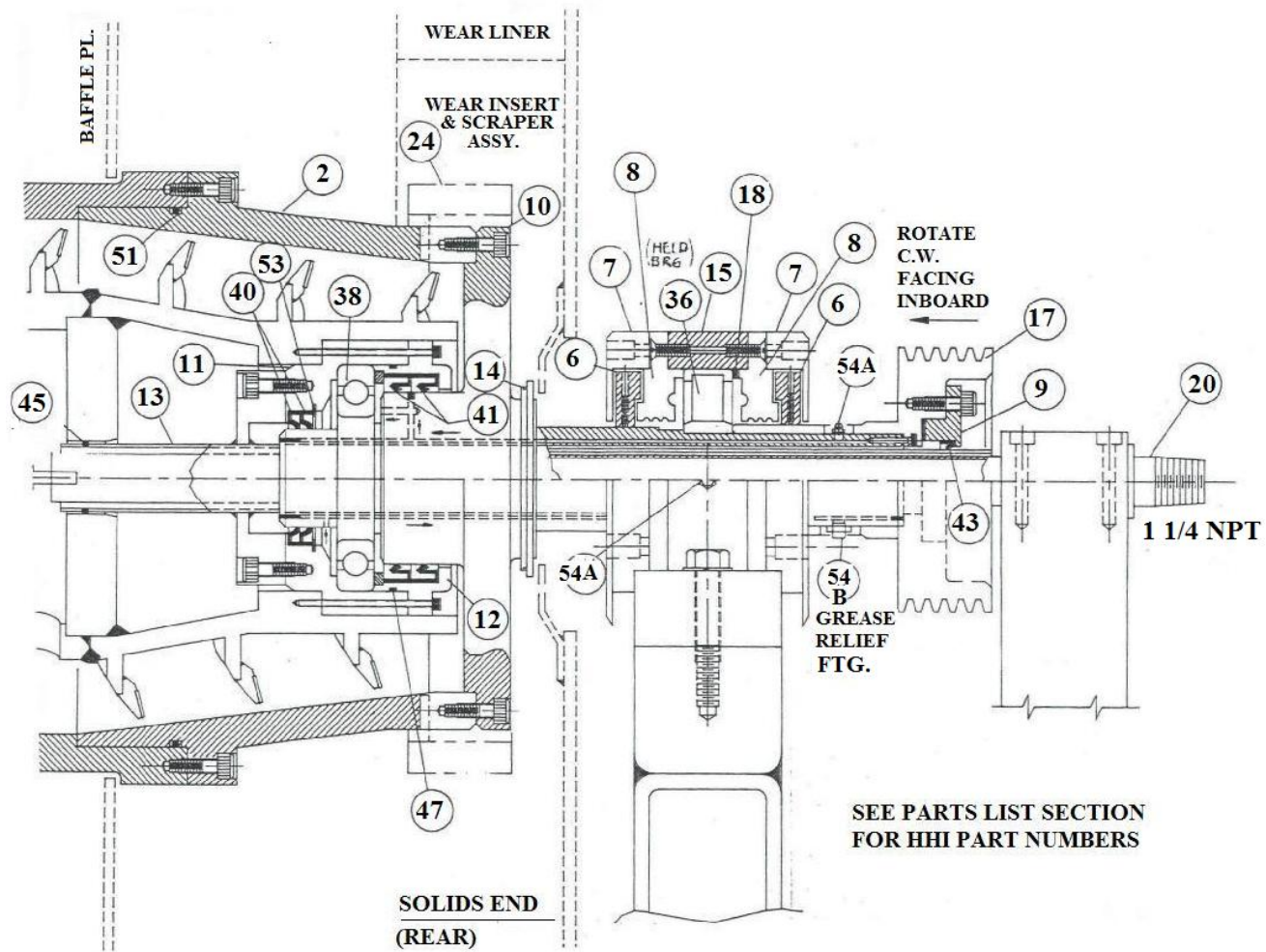
ROTATING ASSEMBLY PART 1

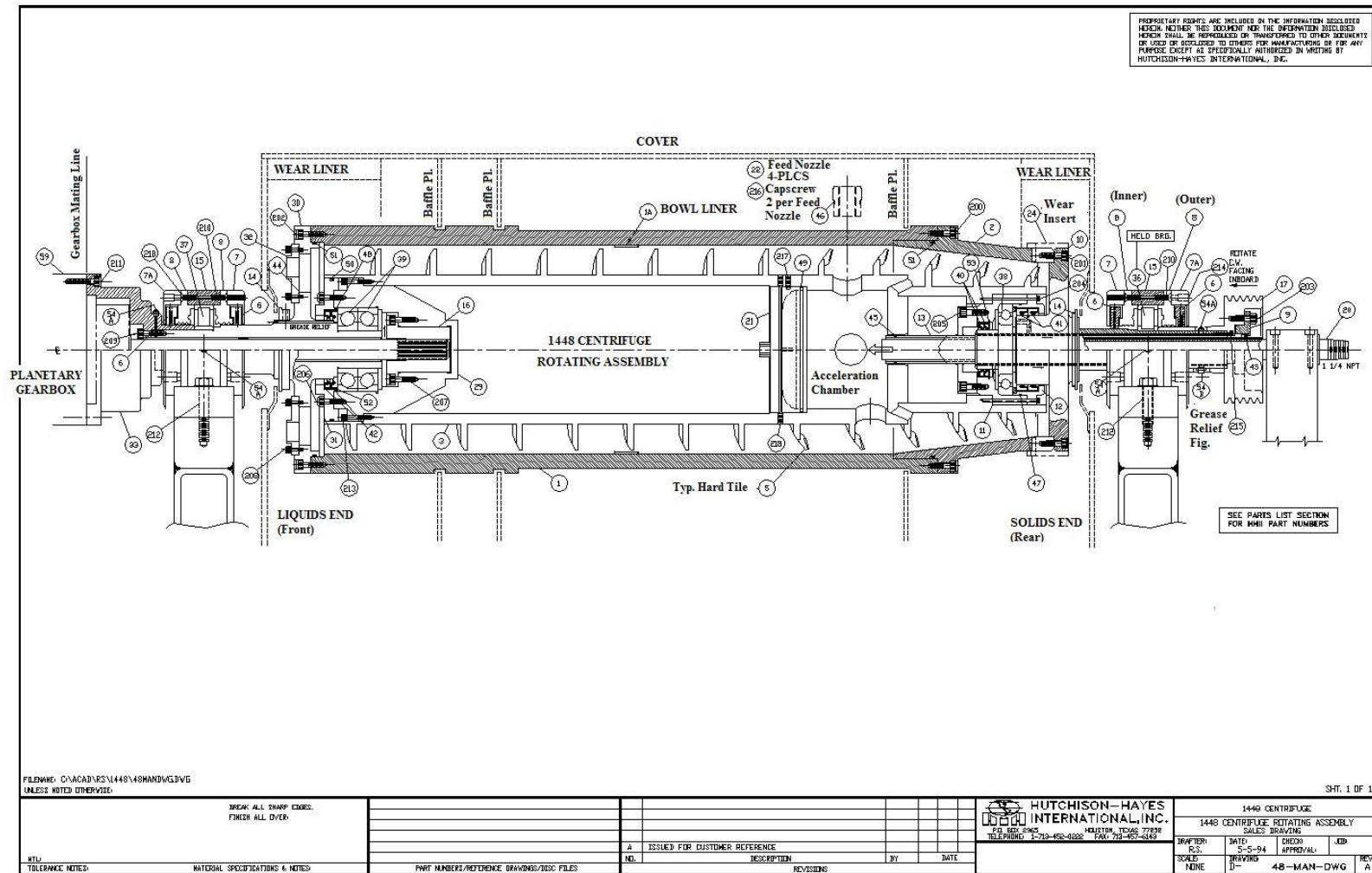


ROTATING ASSEMBLY PART 2



ROTATING ASSEMBLY PART 3







SECTION 11

MISCELLANEOUS

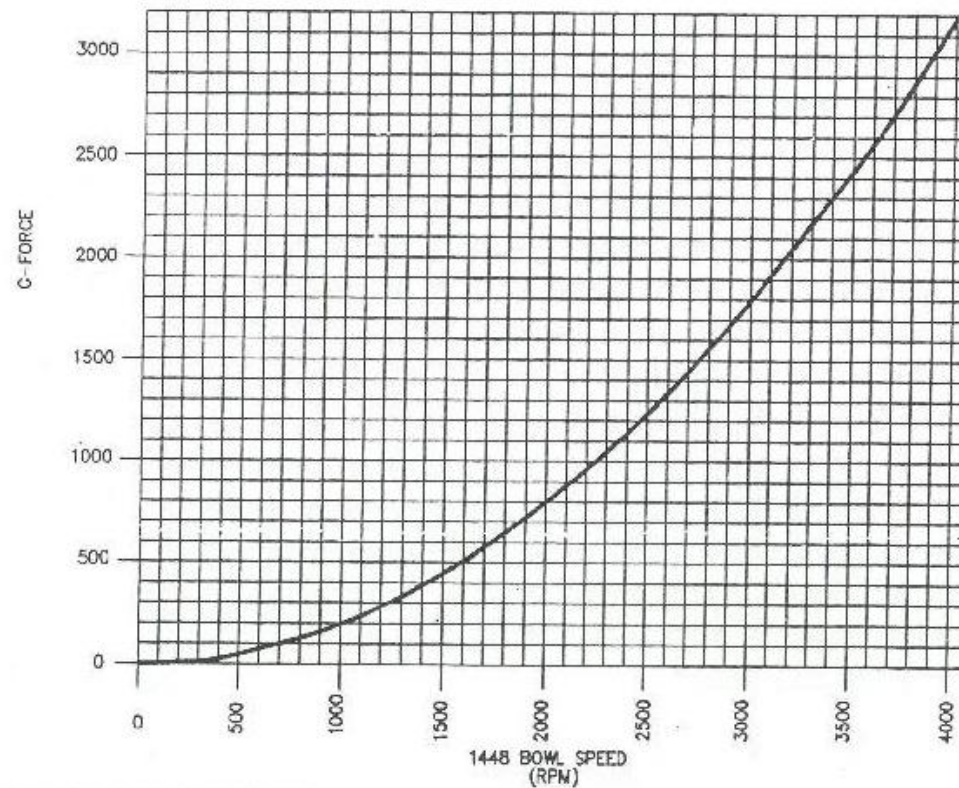
SPARE PARTS LIST

HUTCHISON-HAYES INTERNATIONAL, INC.

(713) 452-0222 FAX: (713) 457-6143 HOUSTON, TEXAS

SHT. 1 OF 1

HHII 1448 CENTRIFUGE
BOWL SPEED VS. G-FORCE
HUTCHISON-HAYES INTNL INC.



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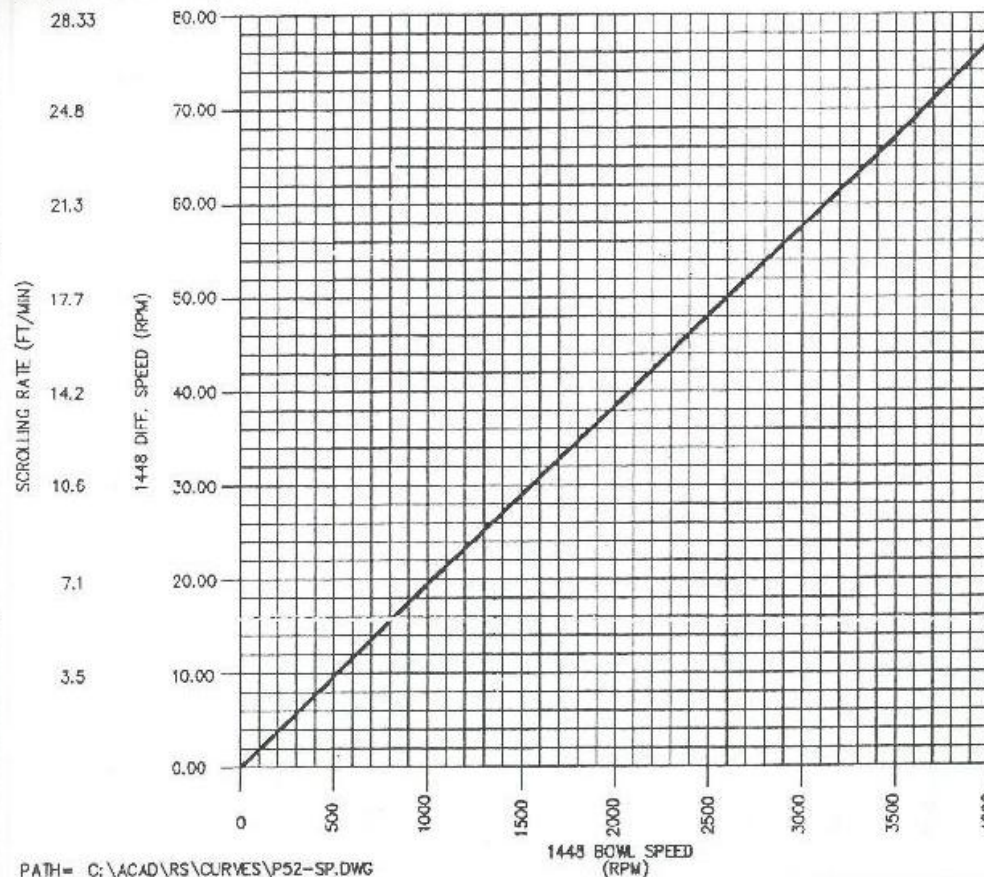
1448 SPEED VS. G-FORCE			
HHII NO.		QTY.	
SCALE		DATE	
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CHK.		DATE	
APR'D		DATE	
DRAW NO.: A-			REV. A

NO.	DESCRIPTION	DATE	A	ISSUED FOR CUSTOMER REFERENCE	DATE
	REVISIONS		NO.	DESCRIPTION	DATE
				REVISIONS	

HUTCHISON-HAYES INTERNATIONAL, INC.

SHT. 1 OF 1

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HH11 1448 CENTRIFUGE
W/P52 GEARBOX & NO BACKDRIVE

BOWL SPEED VS. DIFF. SPEED
HUTCHISON-HAYES INTNL. INC.

PATH = C:\ACAD\RS\CURVES\P52-SP.DWG

1448 BOWL SPEED VS. DIFF. SPEED (P-52)					
HH11 NO.		JOB			
SCALE		QTY.			
MAT'L		DATE			
CHK.		DATE			
APR'D		DATE			
DRAW NO.: A-			1448-P52-SP	REV. A	

NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
			A	ISSUED FOR CUSTOMER REFERENCE	
REVISIONS			REVISIONS		

HUTCHISON-HAYES INTERNATIONAL, INC.

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SHT. 1 OF 1

HHI 1448 CENTRIFUGE W/P-125 GEARBOX (NO BACKDRIVE)

BOWL SPEED VS. DIFF. SPEED

HUTCHISON-HAYES INTNL. INC.

SCROLLING RATE
(FT./MIN.)

12.4

10.6

8.9

7.1

5.3

3.5

1.8

1448 DIFF. SPEED (RPM)

35

30

25

20

15

10

5

0

0

500

1000

1500

2000

2500

3000

3500

4000

1448 BOWL SPEED
(RPM)

PATH= C:\ACAD\RS\CURVES\P125-SP.DWG

1448 SPEED VS. DIFF. SPEED (P-125)

HHI NO.	JOB
SCALE	QTY.
MAT'L	DATE
CHK.	DATE
APR'D	DATE

NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	REVISIONS			REVISIONS	

DRAW NO.: A- 1448-P125-SP REV. A

Storage of HH Centrifuge

Recommended indoor storage and rust prevention procedures for new horizontal decanting centrifuges (long-term storage implies periods in excess of three (3) months idle time.)

Note:

It is the responsibility of the owner to protect and maintain the equipment after shipment from HH.

If the centrifuge is not to be installed immediately after shipment, the unit should be left in the original factory packaging.

Centrifuge Assembly:

1. All accessible openings are closed with tape, over wrap, plugs, etc., for protection.
2. Nameplates are covered with tape.
3. Electrical devices such as the junction box, vibration shutdown switch, micro-switches, conduit boxes, etc., are wrapped with over wrap* and protective tape.
*Over wrap refers to any self-adherent, grease, oil and waterproof material which can be molded around component parts.
4. The grease lubricated pillow block bearings are filled with the specified grease at the factory prior to shipment.
5. The planetary gearbox is filled with the specified lube oil at the factory prior to shipment.
6. The fluid coupling (located at the main drive motor output shaft) is filled with the specified oil at the factory.

Guidelines for Long Term Storage:

1. The centrifuge should be stored in a building with a minimum temperature of 50 Deg. F. (10 Deg. C.). The storage area should be a clean, dry place free from excessive vibration, high humidity, dust, or corrosive fumes.
2. The unit should be tagged with instructions for startup after an extended period of storage.
3. Any loose parts should be boxed with rust inhibitor paper. No paper should be placed on the base of the box and machined unpainted surfaces should be coated with a rust preventive product.
4. The centrifuge assembly should be placed on a sturdy wooden platform. The platform boards should be spaced with 1/ 4" gap between the boards.

5. A protective waterproof shroud should cover the entire centrifuge assembly, top and four (4) sides.

Storage Maintenance:

1. The centrifuge rotating assembly should be rotated by hand at least six (6) times every three (3) months.
2. Leave the sealed openings on the equipment closed.
3. Touch-up any damaged paint surfaces.
4. Do not paint rotating parts or threaded surfaces.
5. Motors should have their shafts rotated every three (3) months in order to keep the bearings lubricated and prevent rusting.

Coatings & Oils:

At regular intervals during equipment storage, all exposed-machined surfaces unpainted steel parts, shafts, pipe fittings, etc., should be examined for signs of rust, pitting, and moisture.

These parts should be thoroughly cleaned and coated with the appropriate medium listed below:

1. Molykote Metal Protector (Dow Corning)

A wax type rust preventative, which may be sprayed, brushed, or dipped onto bare steel parts. This product dries to a hard, dry film, which is almost invisible.

For long storage periods, or shipment overseas, an over wrap must be used.

2. Rust Veto 342 (Houghton Co.)

A soft amber colored material leaving a transparent, dry plastic film on the coated part.

Applied by brushing, dipping or spraying, it is used for maximum heavy-duty protection on interior or exterior surfaces with or without a covering.

Before using the treated part, remove rust veto with solvent.

3. Rust Veto 377 (Houghton Co.)

A light, polar type water-displacing oil. It is used on metal parts stored indoors. It can be sprayed on intricate parts and bearings.

Long-term storage requires an over wrap. Removal from the treated part is not required before use.

An equivalent is: “Antirust #77” WD Oil by International Chemical.

4. Rust Veto Concentrate (Houghton Co.)

A rust preventive that is mixed in one (1) part with nine (9) parts lubricating oil, or hydraulic oil, etc. It is circulated through gearboxes and hydraulic systems and then drained before shipment. It is compatible with most hydraulic oils and removal is not required before use.

5. Ferrocote 346 (Quaker Chemical Co.)

A heavy oil which leaves a soft, paste like film on the part surface. Used for outdoor storage, it must be used with over wrap. The treated part must have this coating removed with solvent before use.

Contact each Manufacturer as required to determine if the rust preventives are compatible with the type of oil you are using.



SECTION 12
VENDOR DATA

Index of Vendor Supplied Data
Operating Instructions and Service Manuals
(Refer to this Section before servicing equipment)

Vibration Switch 04006
“Metrix Instrument Co.” Model 5097-10
(Explosion Proof Model Available)

Heavy Duty Hydraulic Coupling 04012
“Warner Electric” DANA FORMSPRAG
Model 12.4 HSD
For Motor Output Shaft: 2.375” O.D.

PROX Switch Counter 04732
Micro Switch
Model LSXA3K “Honeywell”

Micro Switch
Model LSXA3K “Honeywell” 03130

Baldor Motors & Drives
Main Drive Electric Motor 04755
60 HP 1750 RPM (Mfr. Varies)
Back Drive 04139

High Temp Shutdown Switch (OPTIONAL)
At front & rear pillow block housings
“United Electric Controls Co.”
Model B-121-120-2000-m201
Explosion Proof
Open contact with temp. rise to 220 Deg. F.
(MFR. MAY VARY)



1711 Townhurst DR., Houston, TX 77043-2899
Tel: 713-461-2131 Fax: 713-461-8223
e-mail: techsvcs@metrix1.com



INSTALLATION OF METRIX MODEL 5550 MECHANICAL VIBRATION SWITCH

This bulletin should be used by experienced personnel as a guide to the installation of the Model 5550 vibration switch. Selection or installation of equipment should always be accompanied by competent technical assistance. We encourage you to contact Metrix Instrument Co. or its local representative if further information is required.

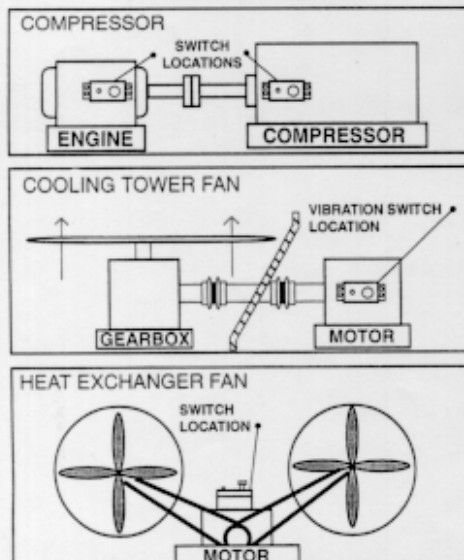
IMPORTANT: BEFORE PROCEEDING TO INSTALL AND WIRE THE UNIT, READ AND THOROUGHLY UNDERSTAND THESE INSTRUCTIONS.

THE SWITCH MODEL NUMBER SHOULD BE CHECKED TO CONFIRM THAT YOU HAVE THE CORRECT HAZARDOUS AREA RATING FOR YOUR APPLICATION. SEE HOW TO ORDER INFORMATION. "A"

INSTALLATION:

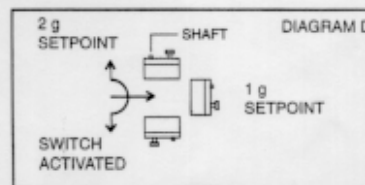
- 1) The sensitive axis of the vibration switch is perpendicular to the mounting base. The preferred mounting is with the sensitive axis in the horizontal plane, since most machines vibrate more in that plane. Mount the switch solidly to the frame of the machine.
- 2) Remove the cover and wire the switch(es) into the alarm or shutdown circuit. Do not exceed switch contact ratings listed in the specifications. **Keep field wiring away from the moving part of the mechanism.**
- 3) Observe all local electrical codes.

TYPICAL INSTALLATIONS



SETPOINT ADJUSTMENT:

- 1) The vibration setpoint adjustment is accessible externally. Turning the setpoint adjustment clockwise (CW) increases the vibration setpoint.
- 2) When the switch is shipped from the factory, the setpoint adjustment is set to 2g when installed in the vertical position and 1g when installed in the horizontal position (with reference to the setpoint adjustment shaft).
- 3) To check factory calibration, place unmounted unit in your hand and rotate per diagram D. The switch(es) should activate at dead bottom position. If necessary, adjust setpoint using the setpoint adjustment screw.



- 4) To preset switch at other than factory setpoint, start with step three (3) and then rotate adjustment screw 1/8 turn per g until you reach the required set point.
- 5) To adjust setpoint when installed on the machine, mount and wire the unit. Reset the switch by depressing the reset plunger and start the machine. When the machine has reached full speed, slowly turn the vibration setpoint adjustment counter-clockwise until the switch trips. Then turn the adjustment clockwise a small amount (approx. 1/8 turn). Reset the switch and restart the machine to determine whether the machine starting roughness will cause the switch to trip, in which case it may be necessary to increase the setpoint.

ELECTRICAL RESET AND STARTUP LOCKOUT:

The optional electrical reset circuit consists of an electrical solenoid in series with a thermistor. If the rated voltage is continuously applied to the reset circuit at machine startup, the reset solenoid energizes for a fixed time interval (approx. 30 sec.), after which time the solenoid is automatically de-energized by the thermistor. This action provides a trip lockout during machine startup roughness. The voltage must be removed from the reset circuit when the machine is stopped to allow the thermistor to cool off. The switch mechanism can then be reset electrically by a momentary application of the reset voltage or it can be reset manually.

NOTE: If the machine is restarted immediately after a shutdown, the lockout period will be shortened because the thermistor will be hot. An increase in the ambient temperature will also shorten the lockout period.

SPECIFICATIONS

Function: Armature mechanism trips on high vibration and operates snap action switch(es).

Amplitude Range: See How to Order. "C"

Frequency Range: 0 to 3600 RPM.

Setpoint Adjust: 0 to 100% of range.
External setpoint adjustment.

Reset: Local reset, plus optional remote reset electrical coil. See How to Order. "D"

Start Delay: Applying reset coil voltage at start up holds mechanism from tripping for 20-30 seconds, after which the switch is active. Requires electric reset option.

Temperature Range: -40 C to 70 C

Enclosure: High strength copper-free (4/10 of 1% max) Aluminum alloy.

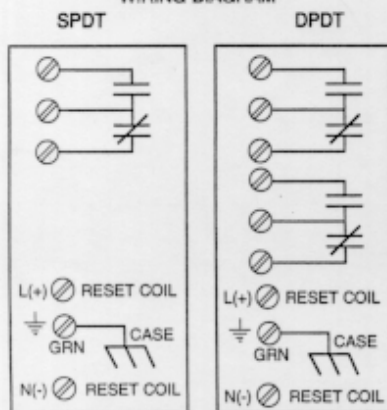
Environmental Rating: NEMA 4, IP 65 & CE Mark

Switch Contact(s) Rating: 15 amps, 125, or 480 Vac; 1/8 hp, 125 Vac; 1/4 hp, 250 Vac; 1/2 amp, 125 Vdc; 1/4 amp, 250 Vdc.

Hazard Rating: See How to Order. "A"

Weight: 2.1 kg (4.5 lbs.)

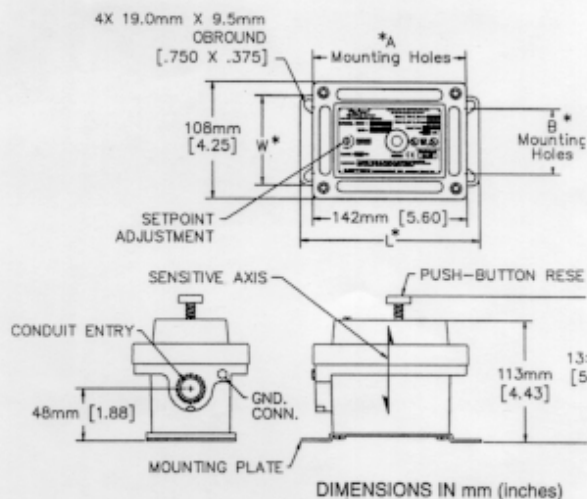
WIRING DIAGRAM



DPDT CONTACTS AND RESET COIL OPTIONAL

"How to Order" Note: For corrosive environments specify powder coating (added charge).

*** Note:** When option A1 or A2 is specified, options E4 and E5 are not allowed.



DIMENSIONS IN mm (inches)

How To Order...

MODEL A B C D E
5550 - ☐ ☐ ☐ - ☐ ☐

Example

5550 - 0 1 1 - 0 1

A ☐

Hazard Area Rating

0= None

*1= UL, cUL Explosion Proof, Class I, Groups C & D, Div 1
Class II, Groups F & G, Div 1

*2= UL, cUL Explosion Proof, Class I, Groups B, C & D, Div 1
Class II, Groups F & G, Div 1

3= CENELEC Flameproof, EEx d IIB T6

4= CENELEC Flameproof, EEx d IIB+H₂ T6

B ☐

Contacts

1= SPDT 2= DPDT

C ☐

Full Scale Range

1= 5 g 2= 2 g 3= 10 g

D ☐

Reset Coil & Start Up Delay

0= None 1= 115 VAC 2= 230 VAC 3= 24 VDC
4= 115 VDC

E ☐

Wiring Entry/Mounting Plate (retrofit)

1= 3/4" NPT/Metrix 5173 or 5175

2= 3/4" NPT/Metrix 5097; VS-2-EX; 366

3= 3/4" NPT/Metrix 5078; 365

*4= M20 x 1.5/Metrix 5097; VS-2-EX; 366

*5= Same as option 4 above with epoxy coated mounting plate

	(L)	(W)	(A)	(B)
E=1	165mm [6.50]	83mm [3.25]	141mm [5.56]	59mm [2.33]
E=2, 4	152mm [6.00]	121mm [4.75]	118mm [4.63]	79mm [3.12]
E=3	165mm [6.50]	121mm [4.75]	136mm [5.37]	92mm [3.62]

Assembly Instructions

NOTE: Tapers to be cleaned with suitable solvent and wiped dry prior to assembly. Do not use molybdenum disulfide or equivalent friction reducing compounds on fasteners or taper.

1. If seal and needle bearing are not in place in sheave hub, install them.
2. Install "O" ring in sheave hub. Mount sheave hub to coupling face using the six 12 point capscrews with "O" rings. Tighten capscrews to 27-30 lb.ft. torque.
3. Install ball bearing into front bearing carrier. Care must be taken not to damage front cover adjacent to flat head screws.
4. To install input shaft, seal bushing with "O" ring, end cap assembly, and retaining ring.
 - a) Install input shaft through sheave hub and into taper in runner hub. Press shaft through ball bearing until it overhangs bearing 3/8 to 7/16 inch.
 - b) Install seal bushing with "O" ring onto overhung end of shaft.
 - c) If seal is not in place in end cap, install it.
 - d) Mount end cap assembly with "O" rings and six 12 point capscrews with "O" rings. Tighten to 27-30 lb.ft. torque.
 - e) Install roll pins in retainer washer. Place retainer washer with roll pins over shaft end making sure pins align with holes in shaft.
 - f) Insert capscrew through retainer washer. Tighten capscrew to 177-195 lb.ft. torque.
 - g) To install collet, loosen capscrew. Insert collet and engage screw hand tight for shipment purposes only.
5. Check air tightness with 5-10 psi pressure applied thru one fill hole.

Service Disassembly Instructions

1. Remove the two pipe plugs in the front cover and impeller. Then allow fluid to drain completely.
2. Remove six 12 point capscrews and "O" rings from end cap and coupling. Remove end cap and "O" ring.
3. Remove hex head capscrew which retains the collet. Remove retainer washer with roll pins.
4. Remove seal bushing and "O" ring from shaft end.
5. Insert push rod* through hole in input shaft to bottom of tapped hole in collet. Use a capscrew* in end of input shaft and tighten against push rod to break taper between input shaft and collet. Use flats on shaft end to counter wrench torque on screw. It may be necessary to tap end of capscrew to break taper contact.
6. Remove input shaft and coupling assembly with sheave from collet. Remove the 3 capscrews retaining the sheave. Remove sheave from sheave hub.
7. Remove six 12 point capscrews and "O" rings from sheave hub and coupling. Remove hub assembly and "O" ring.
8. To remove roller bearing, pry retaining ring out of groove with screwdriver, starting at cut in end. If ring is type with slot in each end, compress ring with snap ring pliers to remove. Tap seal and bearing out of hub, using rod inserted at sheave end.
9. Remove pusher rod from collet. Remove collet from motor shaft.
10. To remove input shaft, support runner on a tube* and press input shaft from runner. Use plug against input shaft to protect threads in shaft.

NOTE: If the front cover and impeller assembly is damaged, the basic unit must be replaced.

Tools required for disassembly

1. Push rod (.50 dia. x 5.25 long steel hardened to R_c50 min.)
2. Tube (3.81 O.D. x 2.75 I.D. x 7.00 long)
3. Capscrew (3/4-10 NC x 1.00 long)

Recommended replacements for overhaul

1. Seals
2. Bearings
3. "O" rings

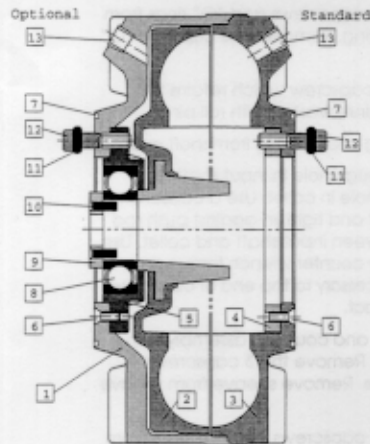
Repair Kit No.

P/N 8-612-005-001-2 - Major Repair Kit, includes 1, 2 & 3

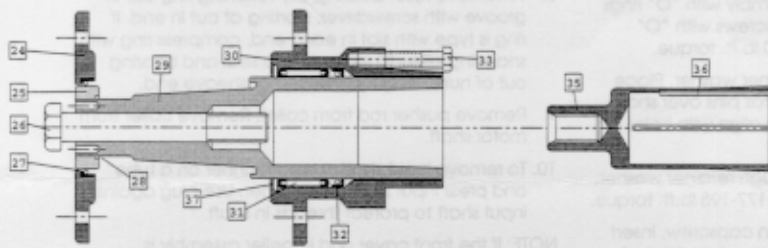
P/N 8-612-005-000-2 - Minor Repair Kit, includes 1 & 3 only.

Model HSD

Input and
Output Side



Base Unit
P/N 8-612-100-000-0



HSD Input and Output
P/N 8-612-005-003-4

Collet

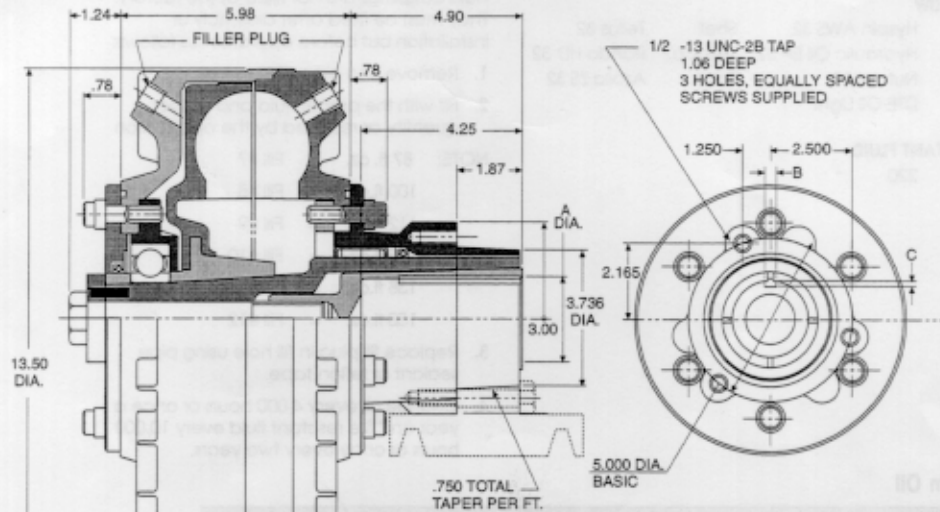
Item	Description	Qty.	Part Number
1	Front Cover	1	Items 1-6 are
2	Runner	1	components of
3	Impeller	1	subassembly
4	Retaining Ring	1	8-612-001-000-0
5	Input Bearing Carrier	1	
6	Flathead Capscrew	4	
7	O-Ring	2	2-756-064-000-2
8	Ball Bearing	1	2-701-015-003-1
9	Retaining Washer	1	4-612-026-000-4
10	Roll Pin	2	2-105-018-075-2
11	O-Ring	12	2-740-003-000-1
12	12 Point Screw	12	2-197-037-011-0
13	Fill Plug	2	2-221-003-420-1

Item	Description	Qty.	Part Number
24	End Cap	1	4-612-046-000-4
25	Seal Bushing	1	4-612-043-000-4
26	Draw Bolt	1	2-173-062-060-0
27	Oil Seal	1	2-730-020-001-0
28	O-Ring	1	2-740-015-001-2
29	Input Shaft	1	4-612-015-004-4
30	Sheave Hub	1	4-612-001-006-2
31	Needle Bearing	1	2-721-032-000-3
32	Oil Seal	1	2-730-032-001-1
33	1/2 NC 2-1/2 Btt.	3	2-172-050-024-0
35	Collet	1	See page 10
36	Step Key	1	See page 10
37	Snap Ring	1	2-745-042-001-1

Model HSD

Assembly No. see chart below

Input and Output — See chart below



Assembly No.	Collet Kit No.	Bore A	B	C
6-612-005-001-0000	8-612-005-005-5	1.625 - 1.627	.3750 - .3735	.182 - .177
6-612-005-002-0000	8-612-005-006-5	1.875 - 1.877	.5000 - .4985	.245 - .240
6-612-005-003-0000	8-612-005-007-5	2.125 - 2.127	.5000 - .4985	.245 - .240
6-612-005-004-0000	8-612-005-008-5	2.375 - 2.377	.6250 - .6235	.307 - .302

Installation Procedure

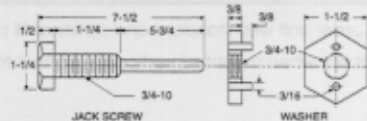
This fluid coupling (hydro sheave) is a complete unit and is to be installed on the end of a drive shaft with a sheave mounted on the fluid coupling. Install in the following sequence:

1. Install stepped key flush with end of drive shaft.
2. Install selected sheave to sheave assembly hub. Tighten cap screws to 40-44 lb.ft. torque.
3. Install coupling assembly on drive shaft. (It may be necessary to free the collet by pushing on loosened center cap screw.) Make sure collet does not ride up on any radius or shoulder on the drive shaft.

NOTE: Shaft must protrude into the collet 3.00 in. min. Tighten exposed center cap screw to 177-195 lb.ft. torque.

CAUTION: The hydro sheave is installed on the end on a shaft and it is essential that a guard be provided.

Suitable sheaves are available from many manufacturers. QD sheaves should be made for SD and SDS hubs.



Removal Tool 8-612-071-001-0

Vertical Mounting for HSD

When mounting vertically, the motor and collet should be mounted above the sheave and fluid coupling.

This position insures even the smallest oil fill will react with the motor. Also, this position allows for addition of and maintenance of the oil level within the fluid coupling.

Order unit with the standard and optional fill plugs.

Fluid Recommendation

OIL: SAE 10W

Castrol:	Hyspin AWS 32	Shell:	Tellus 32
Chevron:	Hydraulic Oil EP 32	Texaco:	Rando HD 32
Esso:	Nuto H 32	Total:	Azolla ZS 32
Mobil:	DTE Oil Light		

FIRE RESISTANT FLUID

Fyrquel: 220

Filling Instructions

Fluid couplings are not filled at the factory. They must be filled after assembly or installation but before operation as follows:

1. Remove one pipe plug.
2. Fill with the proper fluid and proper quantity as required by the application

NOTE:

87 fl. oz.	=	Fill #7
100 fl.oz.	=	Fill #8
112 fl.oz.	=	Fill #9
125 fl.oz.	=	Fill #10
138 fl.oz.	=	Fill #11
150 fl.oz.	=	Fill #12

3. Replace fill plug in fill hole using pipe sealant or teflon tape.
4. Change oil every 4,000 hours or once a year and fire resistant fluid every 10,000 hours or once every two years.

Petroleum Oil

HP	Coupling Size	1200 RPM			1800 RPM			HP	KW
		Fill No.	% Slip		Fill No.	% Slip			
5	12.4	7	3					5	3.8
7-1/2	12.4	8	2-1/2					7-1/2	5.6
10	12.4	9	4					10	7-1/2
15	12.4	11	5	12.4	7	3		15	11.3
20	12.4*	11-1/2	7	12.4	8	2-1/2		20	15.0
25	12.4*	12	7	12.4	8-1/2	3		25	18.8
30				12.4	9	3-1/2		30	22.5
40				12.4	10	4		40	30.0
50				12.4	11	5		50	37-1/2
60				12.4	11	6		60	45.0

Note: For vertical mounting, order unit with standard and optional fill plugs.

Note: Reduced power capability when mounted vertically - consult factory.

Application Notes

1. Max allowable operating speed: All models 2400 RPM, except HSD - 1800 RPM.
2. Select sheave, verifying that:
 - a. HP and speed of sheave and belts do not exceed manufacturers' recommendations.
 - b. Sheave does not interfere with motor frame when motor shaft protrudes 3.00 in. min. into collet.

- In these applications, coupling will develop stall torque somewhat higher than motor breakdown torque.
 - **Caution!** 7% or higher slips may cause overheating if coupling is cycled too rapidly.
- For minimum operating temperatures below -10°F, Consult Warner Electric.

BALDOR[®] MOTORS AND DRIVES

Explosion Proof AC and DC Motors





**Integral Horsepower
AC Induction Motors
ODP, WPI, WP II Enclosure
TEFC Enclosure
Explosion Proof**

Installation & Operating Manual

7/02

MN400

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Section 1

General Information

Overview This manual contains general procedures that apply to Baldor Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the Warning and Caution statements. A Warning statement indicates a possible unsafe condition that can cause harm to personnel. A Caution statement indicates a condition that can cause damage to equipment.

Important: This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual describes general guidelines that apply to most of the motor products shipped by Baldor. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact your Baldor distributor for more information or clarification.

Before you install, operate or perform maintenance, become familiar with the following:

- NEMA Publication MG-2, Safety Standard for Construction and guide for Selection, Installation and Use of Electric Motors and Generators.
- The National Electrical Code
- Local codes and Practices

Limited Warranty

1. Baldor Electric motors are warranted for a period of one (1) year, from date of shipment from the factory or factory warehouse against defects in material and workmanship. To allow for stocking and/or fabrication period and to provide one year of actual service, the warranty period is extended for an additional period of six (6) months for a total of eighteen (18) months from the original date of shipment from the factory or factory warehouse stock. In no case will the warranty period be extended for a longer period. Baldor extends this limited warranty to each buyer of the electric motor for the purpose of resale and to the original purchaser for use.
2. Baldor will, at its option repair or replace a motor which fails due to defects in material or workmanship during the warranty period if:
 - a. the purchaser presents the defective motor at or ships it unrepaid to, the Baldor plant in Fort Smith, Arkansas or one of the Baldor Authorized Service Centers and
 - b. the purchaser gives written notification concerning the motor and the claimed defect including the date purchased, the task performed by the Baldor motor and the problem encountered.
3. Baldor will not pay the cost of removal of any electric motor from any equipment, the cost of delivery to Fort Smith, Arkansas or a Baldor Authorized Service Center, or the cost of any incidental or consequential damages resulting from the claimed defects. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you.) Any implied warranty given by laws shall be limited to the duration of the warranty period hereunder. (Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.)
4. Baldor Authorized Service Centers, when convinced to their satisfaction that a Baldor motor developed defects in material or workmanship within the warranty period, are authorized to proceed with the required repairs to fulfill Baldor's warranty when the cost of such repairs to be paid by Baldor does not exceed Baldor's warranty repair allowance. Baldor will not pay overtime premium repair charges without prior written authorization.
5. The cost of warranty repairs made by centers other than Baldor Authorized Service Centers **WILL NOT** be paid unless first authorized in writing by Baldor.
6. Claims by a purchaser that a motor is defective even when a failure results within one hour after being placed into service are not always justified. Therefore, Baldor Authorized Service Centers must determine from the condition of the motor as delivered to the center whether or not the motor is defective. If in the opinion of a Baldor Authorized Service Center, a motor did not fail as a result of defects in material or workmanship, the center is to proceed with repairs only if the purchaser agrees to pay for such repairs. If the decision is in dispute, the purchaser should still pay for the repairs and submit the paid invoice and the Authorized Service Center's signed service report to Baldor for further consideration.
7. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Note that **Baldor Super-E® Premium Efficiency** electric motors are warranted for a period of three (3) years. **Baldor IEEE 841** electric motors are warranted for a period of five (5) years. All other terms and conditions of the Limited Warranty statement apply.

Safety Notice:

This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment.

Be sure that you are completely familiar with NEMA publication MG-2, safety standards for construction and guide for selection, installation and use of electric motors and generators, the National Electrical Code and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

- WARNING:** Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.
- WARNING:** Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.
- WARNING:** Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.
- WARNING:** This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install operate or maintain this equipment.
- WARNING:** Do not by-pass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.
- WARNING:** Avoid the use of automatic reset devices if the automatic restarting of equipment can be hazardous to personnel or equipment.
- WARNING:** Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.
- WARNING:** Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.
- WARNING:** Before performing any motor maintenance procedure, be sure that the equipment connected to the motor shaft cannot cause shaft rotation. If the load can cause shaft rotation, disconnect the load from the motor shaft before maintenance is performed. Unexpected mechanical rotation of the motor parts can cause injury or motor damage.
- WARNING:** Disconnect all electrical power from the motor windings and accessory devices before disassembly of the motor. Electrical shock can cause serious or fatal injury.
- WARNING:** Do not use these motors in the presence of flammable or combustible vapors or dust. These motors are not designed for atmospheric conditions that require explosion proof operation.

Safety Notice Continued

- WARNING:** Motors that are to be used in flammable and/or explosive atmospheres must display the UL label on the nameplate.
- Specific service conditions for these motors are defined in NEC 70-599.
- WARNING:** UL rated motors must only be serviced by authorized Baldor Service Centers. If these motors are to be returned to a flammable and/or explosive atmosphere.
- Caution:** To prevent premature equipment failure or damage, only qualified maintenance personnel should perform maintenance.
- Caution:** Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load from the motor shaft before moving the motor.
- Caution:** If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.
- Caution:** To prevent equipment damage, be sure that the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.
- Caution:** If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG-1 and MG-2 standards to avoid equipment damage.

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your Baldor distributor or an Authorized Baldor Service Center.

Receiving

Each Baldor Electric Motor is thoroughly tested at the factory and carefully packaged for shipment. When you receive your motor, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your motor.
2. Verify that the part number of the motor you received is the same as the part number listed on your purchase order.

Storage

If the motor is not put into service immediately, the motor must be stored in a clean, dry and warm location. Several precautionary steps must be performed to avoid motor damage during storage.

1. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
2. Do not lubricate bearings during storage. Motor bearings are packed with grease at the factory. Excessive grease can damage insulation quality.
3. Rotate motor shaft at least 10 turns every two months during storage (more frequently if possible). This will prevent bearing damage due to storage.
4. If the storage location is damp or humid, the motor windings must be protected from moisture. This can be done by applying power to the motors' space heater (if available) while the motor is in storage.

Unpacking

Each Baldor motor is packaged for ease of handling and to prevent entry of contaminants.

1. To avoid condensation inside the motor, do not unpack until the motor has reached room temperature. (Room temperature is the temperature of the room in which it will be installed). The packing provides insulation from temperature changes during transportation.
2. When the motor has reached room temperature, remove all protective wrapping material from the motor.

Handling

The motor should be lifted using the lifting lugs or eye bolts provided.

1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift only the motor. Never lift the motor by the motor shaft or the hood of a WP11 motor.
2. When lifting a WP11 (weatherproof Type 2) motor, do not lift the motor by inserting lifting lugs into holes on top of the cooling hood. These lugs are to be used for hood removal only. A spreader bar should be used to lift the motor by the cast lifting lugs located on the motor frame.
3. If the motor must be mounted to a plate with the driven equipment such as pump, compressor etc., it may not be possible to lift the motor alone. For this case, the assembly should be lifted by a sling around the mounting base. The entire assembly can be lifted as an assembly for installation. Do not lift using the motor lugs or eye bolts provided.

If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting.

Section 2

Installation & Operation

Overview

Installation should conform to the National Electrical Code as well as local codes and practices. When other devices are coupled to the motor shaft, be sure to install protective devices to prevent future accidents. Some protective devices include: coupling, belt guard, chain guard, shaft covers etc. These protect against accidental contact with moving parts. Machinery that is accessible to personnel should provide further protection in the form of guard rails, screening, warning signs etc.

Location

The motor should be installed in an area that is protected from direct sunlight, corrosives, harmful gases or liquids, dust, metallic particles, and vibration. Exposure to these can reduce the operating life and degrade performance. Be sure to allow clearance for ventilation and access for cleaning, repair, service and inspections. Ventilation is extremely important. Be sure the area for ventilation is not obstructed. Obstructions will limit the free passage of air. Motors get warm and the heat must be dissipated to prevent damage.

These motors are not designed for atmospheric conditions that require explosion proof operation. They must NOT be used in the presence of flammable or combustible vapors or dust.

1. ODP motors are suitable only for indoor applications.
2. TEFC and WPII motors are suitable for indoor or outdoor standard service applications.

Mounting

The motor must be securely installed to a rigid foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.

Foundation caps and sole plates are designed to act as spacers for the equipment; they support. If these devices are used, be sure that they are evenly supported by the foundation or mounting surface.

After installation is complete and accurate alignment of the motor and load is accomplished, the base should be grouted to the foundation to maintain this alignment.

The standard motor base is designed for horizontal or vertical mounting. Adjustable or sliding rails are designed for horizontal mounting only. Consult your Baldor distributor or authorized Baldor Service Center for further information.

Alignment

Accurate alignment of the motor with the driven equipment is extremely important.

1. Direct Coupling

For direct drive, use flexible couplings if possible. Consult the drive or equipment manufacturer for more information. Mechanical vibration and roughness during operation may indicate poor alignment. Use dial indicators to check alignment. The space between coupling hubs should be maintained as recommended by the coupling manufacturer.

2. End-Play Adjustment

The axial position of the motor frame with respect to its load is also extremely important. The motor bearings are not designed for excessive external axial thrust loads. Improper adjustment will cause failure.

3. Pulley Ratio

The pulley ratio should not exceed 8:1.

4. Belt Drive

Align sheaves carefully to minimize belt wear and axial bearing loads (see End-Play Adjustment). Belt tension should be sufficient to prevent belt slippage at rated speed and load. However, belt slippage may occur during starting.

Caution: Do not over tension belts.

5. Sleeve bearing motors are only suitable for coupled loads.

Doweling & Bolting

After proper alignment is verified, dowel pins should be inserted through the motor feet into the foundation. This will maintain the correct motor position should motor removal be required. (Baldor motors are designed for doweling.)

1. Drill dowel holes in diagonally opposite motor feet in the locations provided.
2. Drill corresponding holes in the foundation.
3. Ream all holes.
4. Install proper fitting dowels.
5. Mounting bolts must be carefully tightened to prevent changes in alignment. Use a flat washer and lock washer under each nut or bolt head to hold the motor feet secure. Flanged nuts or bolts may be used as an alternative to washers.

Power Connection

Motor and control wiring, overload protection, disconnects, accessories and grounding should conform to the National Electrical Code and local codes and practices.

Conduit Box

For ease of making connections, an oversize conduit box is provided. The box can be rotated 360° in 90° increments. Auxiliary conduit boxes are provided on some motors for accessories such as space heaters, RTD's etc.

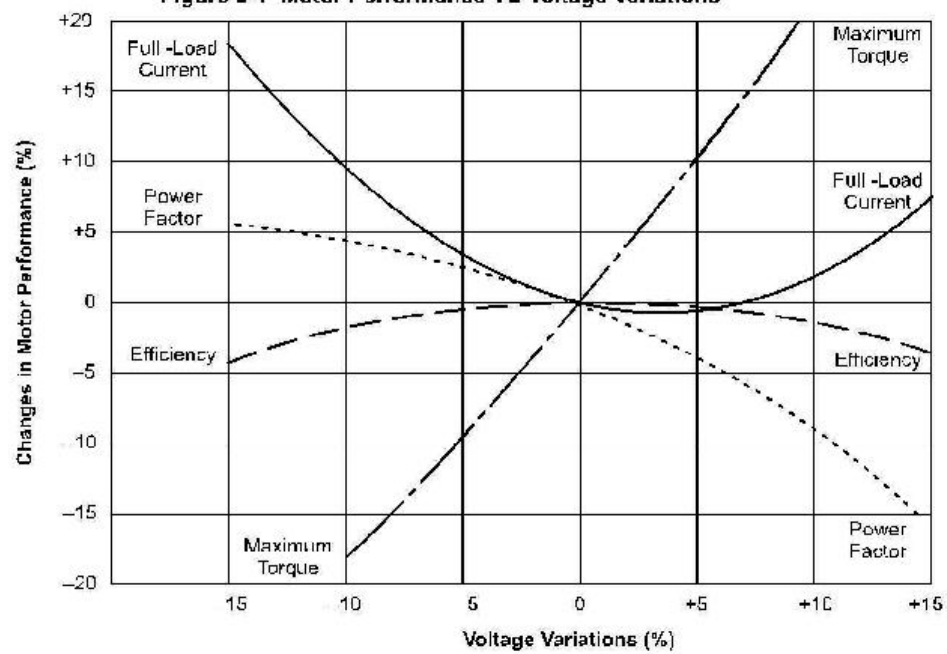
AC Power

Connect the motor leads as shown on the connection diagram located on the name plate or inside the cover on the conduit box. Be sure the following guidelines are met:

1. AC power is within $\pm 10\%$ of rated voltage with rated frequency. (See motor name plate for ratings).
OR
2. AC power is within $\pm 5\%$ of rated frequency with rated voltage.
OR
3. A combined variation in voltage and frequency of $\pm 10\%$ (sum of absolute values) of rated values, provided the frequency variation does not exceed $\pm 5\%$ of rated frequency.

Performance within these voltage and frequency variations are shown in Figure 2-1.

Figure 2-1 Motor Performance VS Voltage Variations



First Time Start Up

Be sure that all power to motor and accessories is off. Be sure the motor shaft is disconnected from the load and will not cause mechanical rotation of the motor shaft.

1. Make sure that the mechanical installation is secure. All bolts and nuts are tightened etc.
2. If motor has been in storage or idle for some time, check winding insulation integrity with a Megger.
3. Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity.
4. Be sure all shipping materials and braces (if used) are removed from motor shaft.
5. Manually rotate the motor shaft to ensure that it rotates freely.
6. Replace all panels and covers that were removed during installation.
7. Momentarily apply power and check the direction of rotation of the motor shaft.
8. If motor rotation is wrong, be sure power is off and change the motor lead connections. Verify rotation direction before you continue.
9. Start the motor and ensure operation is smooth without excessive vibration or noise. If so, run the motor for 1 hour with no load connected.
10. After 1 hour of operation, disconnect power and connect the load to the motor shaft. Verify all coupling guards and protective devices are installed. Ensure motor is properly ventilated.

Coupled Start Up

This procedure assumes a coupled start up. Also, that the first time start up procedure was successful.

1. Check the coupling and ensure that all guards and protective devices are installed.
2. Check that the coupling is properly aligned and not binding.
3. The first coupled start up should be with no load. Apply power and verify that the load is not transmitting excessive vibration back to the motor through the coupling or the foundation. Vibration should be at an acceptable level.
4. Run for approximately 1 hour with the driven equipment in an unloaded condition.

The equipment can now be loaded and operated within specified limits. Do not exceed the name plate ratings for amperes for steady continuous loads.

Jogging and Repeated Starts Repeated starts and/or jogs of induction motors generally reduce the life of the motor winding insulation. A much greater amount of heat is produced by each acceleration or jog than that by the same motor under full load. If it is necessary to repeatedly start or jog the motor, it is advisable to check the application with your local Baldor distributor or Baldor Service Center.

Heating - Duty rating and maximum ambient temperature are stated on the motor name plate. Do not exceed these values. If there is any question regarding safe operation, contact your local Baldor distributor or Baldor Service Center.

Section 3 Maintenance & Troubleshooting

WARNING: UL rated motors must only be serviced by authorized Baldor Service Centers if these motors are to be returned to a flammable and/or explosive atmosphere.

General Inspection

Inspect the motor at regular intervals, approximately every 500 hours of operation or every 3 months, whichever occurs first. Keep the motor clean and the ventilation openings clear. The following steps should be performed at each inspection.

WARNING: Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

1. Check that the motor is clean. Check that the interior and exterior of the motor is free of dirt, oil, grease, water, etc. Oily vapor, paper pulp, textile lint, etc. can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.
2. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
3. Check all electrical connectors to be sure that they are tight.

Lubrication & Bearings

Bearing grease will lose its lubricating ability over time, not suddenly. The lubricating ability of a grease (over time) depends primarily on the type of grease, the size of the bearing, the speed at which the bearing operates and the severity of the operating conditions. Good results can be obtained if the following recommendations are used in your maintenance program.

Type of Grease

A high grade ball or roller bearing grease should be used. Recommended grease for standard service conditions is Polyrex EM (Exxon Mobil).

Equivalent and compatible greases include:

Texaco Polystar, Rykon Premium #2, Pennzoil Pen 2 Lube and Chevron SRI.

- Maximum operating temperature for standard motors = 110° C.
- Shut-down temperature in case of a malfunction = 115° C.

Lubrication Intervals

Recommended lubrication intervals are shown in Table 3-1. It is important to realize that the recommended intervals of Table 3-1 are based on average use.

Refer to additional information contained in Tables 3-2 and 3-3.

Table 3-1 Lubrication Intervals *

NEMA / (IEC) Frame Size	Rated Speed - RPM					
	10000	6000	3600	1800	1200	900
Up to 210 incl. (132)	**	2700 Hrs.	5500 Hrs.	12000 Hrs.	18000 Hrs.	22000 Hrs.
Over 210 to 280 incl. (180)			3600 Hrs.	9500 Hrs.	15000 Hrs.	18000 Hrs.
Over 280 to 360 incl. (225)			* 2200 Hrs.	7400 Hrs.	12000 Hrs.	15000 Hrs.
Over 360 to 5800 incl. (300)			*2200 Hrs.	3500 Hrs.	7400 Hrs.	10500 Hrs.

* Lubrication intervals are for ball bearings. For roller bearings, divide the listed lubrication interval by 2.

** For 6205 and 6806 bearings. For 6807 bearings, consult oil mist lubrication (MN401).
Relubrication interval for 6205 bearing bearing is 1550Hrs. (using grease lubrication).
Relubrication interval for 6806 bearing bearing is 720Hrs. (using grease lubrication).

Table 3-2 Service Conditions

Severity of Service	Ambient Temperature Maximum	Atmospheric Contamination	Type of Bearing
Standard	40° C	Clean, Little Corrosion	Deep Groove Ball Bearing
Severe	50° C	Moderate dirt, Corrosion	Ball Thrust, Roller
Extreme	>50° C* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion	All Bearings
Low Temperature	<-30° C **		

* Special high temperature grease is recommended (Dow Corning DC44). Note that Dow Corning DC44 grease does not mix with other grease types. Thoroughly clean bearing & cavity before adding grease.

** Special low temperature grease is recommended (Aeroshell 7).

Table 3-3 Lubrication Interval Multiplier

Severity of Service	Multiplier
Standard	1.0
Severe	0.5
Extreme	0.1
Low Temperature	1.0

Table 3-4 Bearings Sizes and Types

Frame Size NEMA (IEC)	Bearing Description (These are the "Large" bearings (Shaft End) in each frame size)					
	Bearing	OD D mm	Width B mm	Weight of Grease to add * oz (Grams)	Volume of grease to be added in ³ tea- spoon	
Up to 210 incl. (132)	6307	80	21	0.30 (8.4)	0.6	2.0
Over 210 to 280 incl. (180)	6311	120	29	0.61 (17)	1.2	3.9
Over 280 to 360 incl. (225)	6313	140	33	0.81 (23)	1.5	5.2
Over 360 to 449 incl. (280)	6319	200	45	2.12 (60)	4.1	13.4
Over 5000 to 5800 incl. (355)	6328	300	62	4.70 (130)	3.2	30.0
Over 360 to 449 incl. (280)	NU319	200	45	2.12 (60)	4.1	13.4
Over 5000 to 5800 incl. (355)	NU328	300	62	4.70 (130)	3.2	30.0
Spindle Motors						
76 Frame	6207	72	17	0.22 (6.1)	0.44	1.4
77 Frame	6210	90	20	0.32 (9.0)	0.64	2.1
80 Frame	6213	120	23	0.49 (14.0)	0.99	3.3

* Weight in grams = .005 DB

Note: Not all bearing sizes are listed. For intermediate bearing sizes, use the grease volume for the next larger size bearing.

Lubrication Procedure

Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult your Baldor distributor or an authorized service center if a grease other than the recommended type is to be used.

Caution: To avoid damage to motor bearings, grease must be kept free of dirt. For an extremely dirty environment, contact your Baldor distributor or an authorized Baldor Service Center for additional information.

With Grease Outlet Plug

1. Clean all grease fittings.
2. Remove grease outlet plug.
3. If motor is stopped, add the recommended amount of grease.

If motor is to be greased while running, a slightly greater quantity of grease will have to be added. Add grease slowly until new grease appears at shaft hole in the endplate or purge outlet plug.

4. Re-install grease outlet plug.

Without Grease Outlet Plug

1. Disassemble motor.
2. Add recommended amount of grease to bearing and bearing cavity. (Bearing should be about 1/3 full of grease and outboard bearing cavity should be about 1/2 full of grease.)

Note: Bearing is 1/3 full when only one side of bearing is completely full of grease.

3. Assemble motor.

Sample Lubrication Determination

Assume - NEMA 286T (IEC 180), 1750 RPM motor driving an exhaust fan in an ambient temperature of 43° C and the atmosphere is moderately corrosive.

1. Table 3-1 list 9500 hours for standard conditions.
2. Table 3-2 classifies severity of service as "Severe".
3. Table 3-3 lists a multiplier value of 0.5 for Severe conditions.
4. Table 3-4 shows that 1.2 in³ or 3.9 teaspoon of grease is to be added.

Note: Smaller bearings in size category may require reduced amounts of grease.

Accessories

The following is a partial list of accessories available from Baldor. Contact your Baldor distributor for availability and pricing information.

Note: Space heaters and RTD's are standard on some motors.

Bearing RTD

RTD (Resistance Temperature Detector) devices are used to measure or monitor the temperature of the motor bearing during operation.

Bearing Thermocouples

Used to measure or monitor bearing temperatures.

Bearing Thermostat

Temperature device that activates when bearing temperatures are excessive. Used with an external circuit to warn of excessive bearing temperature or to shut down a motor.

Conduit Boxes

Optional conduit boxes are available in various sizes to accommodate accessory devices.

Cord & Plug Assembly

Adds a line cord and plug for portable applications.

Drains and Breathers

Stainless steel drains with separate breathers are available.

Drip Covers

Designed for use when motor is mounted in a vertical position. Contact your Baldor distributor to confirm that the motor is designed for vertical mounting.

Fan Cover & Lint Screen

To prevent build-up of debris on the cooling fan.

Nameplate

Additional stainless steel nameplates are available.

Roller Bearings

Recommended for belt drive applications with a speed of 1800 RPM or less.

Rotation Arrow Labels

Rotation arrows are supplied on motors designed to operate in one direction only. Additional rotation arrows are available.

Space Heater

Added to prevent condensation of moisture within the motor enclosure during periods of shut down or storage.

Stainless Hardware

Stainless steel hardware is available. Standard hardware is corrosion resistant zinc plated steel.

Winding RTD

RTD (Resistance Temperature Detector) devices are used to measure or monitor the temperature of the motor winding during operation.

Winding Thermocouples

Used to measure or monitor winding temperatures.

Winding Thermostat

Temperature device that activates when winding temperatures are excessive. Used with an external circuit to warn of excessive winding temperature or to shut down a motor.

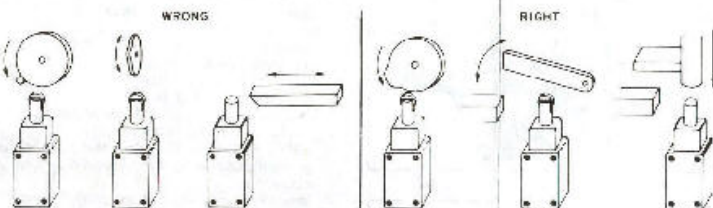
Note: On some motors, leads for accessory devices are brought out to a separate conduit box located on the side of the motor housing (unless otherwise specified).

Table 3-5 Troubleshooting Chart

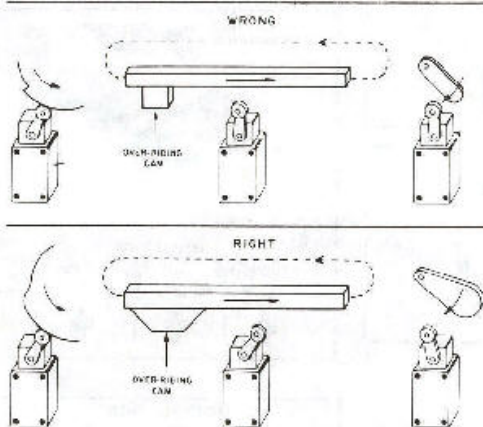
Symptom	Possible Causes	Possible Solutions
Motor will not start	Usually caused by line trouble, such as, single phasing at the starter.	Check source of power. Check overloads, fuses, controls, etc.
Excessive humming	High Voltage. Eccentric air gap.	Check input line connections. Have motor serviced at local Baldor service center.
Motor Over Heating	Overload. Compare actual amps (measured) with nameplate rating.	Locate and remove source of excessive friction in motor or load. Reduce load or replace with motor of greater capacity.
	Single Phasing.	Check current at all phases (should be approximately equal) to isolate and correct the problem.
	Improper ventilation.	Check external cooling fan to be sure air is moving properly across cooling fins. Excessive dirt build-up on motor. Clean motor.
	Unbalanced voltage.	Check voltage at all phases (should be approximately equal) to isolate and correct the problem.
	Rotor rubbing on stator.	Check air gap clearance and bearings. Tighten "Thru Bolts".
	Over voltage or under voltage.	Check input voltage at each phase to motor.
	Open stator winding.	Check stator resistance at all three phases for balance.
	Grounded winding. Improper connections.	Perform dielectric test and repair as required. Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity. Refer to motor lead connect on diagram.
Bearing Over Heating	Misalignment.	Check and align motor and driven equipment.
	Excessive belt tension.	Reduce belt tension to proper point for load.
	Excessive end thrust.	Reduce the end thrust from driven machine.
	Excessive grease in bearing.	Remove grease until cavity is approximately $\frac{3}{4}$ filled.
	Insufficient grease in bearing.	Add grease until cavity is approximately $\frac{3}{4}$ filled.
Vibration	Dirt in bearing.	Clean bearing cavity and bearing. Repack with correct grease until cavity is approximately $\frac{3}{4}$ filled.
	Misalignment.	Check and align motor and driven equipment.
	Rubbing between rotating parts and stationary parts.	Isolate and eliminate cause of rubbing.
	Rotor out of balance.	Have rotor balance checked and repaired at your Baldor Service Center.
	Resonance.	Tune system or contact your Baldor Service Center for assistance.
Noise	Foreign material in air gap or ventilation openings.	Remove rotor and foreign material. Reinstall rotor. Check insulation integrity. Clean ventilation openings.
Growling or whining	Bad bearing.	Replace bearing. Clean all grease from cavity and new bearing. Repack with correct grease until cavity is approximately $\frac{3}{4}$ filled.

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PROPER APPLICATION OF LIMIT SWITCHES



For limit switches with pushrod actuators, the actuating force should be applied as nearly as possible in line with the pushrod axis.



Cam or dog arrangements should be such that the actuator is not suddenly released to snap back freely.

MICRO SWITCH
a Honeywell Division

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MICRO SWITCH a Honeywell Division

Installation instructions explosion proof heavy duty LSX limit switches

PK 8118 1

NON-PLUG-IN (Single-Pole or Double-Pole)

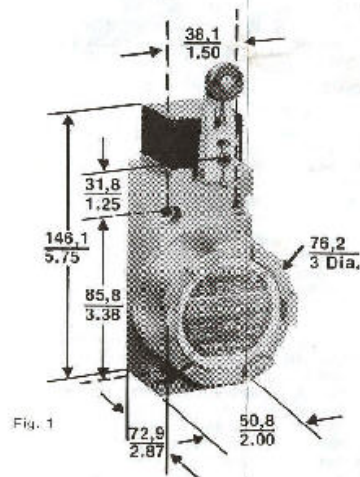


Fig. 1

MICRO SWITCH explosion proof switches are designed specifically for use in hazardous location applications. For a general description and classification of hazardous atmospheres refer to MICRO SWITCH Catalog 40. In addition to meeting explosion proof requirements the LSX meets additional liquid sealing classifications. This makes the LSX ideal for outdoor use or in adverse environments where a combination of explosion proof plus sealing requirements are needed.

To comply with explosion proof requirements the LSX has flame paths within the housing which cool exploding gases below the kindling temperature before they reach explosive gases surrounding the housing. Flame paths on the LSX are (1) an extended plunger between the switch cavity and head and (2) the cover housing threads on the front of the switch. Liquid sealing is accomplished by an O-ring seal located outside the threads and the same field proven seals of the standard HDLS head.

The LSX enclosure is sealed for protection against corrosion, water, dust and oil as defined in NEMA 1, 3, 3R, 4, 4X, 6, 12 and 13. These enclosures also meet NEMA standards for hazardous locations type 7 Class I Groups B, C and D and type 9 Class I Groups E, F and G.

MOUNTING INSTRUCTIONS

ML-E1 MOUNTING

The LSX has the same mounting and tracking as the original MICRO SWITCH explosion proof limit switch (the ML-E1). The ML-E1 has been a standard in the industry for many years and the LSX is interchangeable. The LSX may be mounted with two 1/4 inch screws from the front or from the back with two 5/16 inch screws. See figure #1.

HDLS MOUNTING

If it is desired to mount on existing HDLS mounting hole locations, the adapter plate (Catalog Listing LSXZ4023) must be used. The adapter plate is attached in the HDLS location. Position the plate so the screw heads fit into the plate recesses provided. Now simply attach the LSX to the adapter plate using the two 3/16 screws and the smaller mounting holes. The mounting plate fits into the recess in the back of the LSX. It is good practice not to mount the switch upside down or at the low point of long conduit runs.

NEW INSTALLATIONS

Note mounting dimension drawing (Figure 1) for hole locations.

